ENVIRONMENTAL FACTORS AS CORRELATES OF SENIOR SECONDARY SCHOOL STUDENTS' COGNITIVE ACHIEVEMENT IN BIOLOGY IN DELTA AND EDO STATES

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BY

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A THESIS WRITTEN IN THE DEPARTMENT OF GUIDANCE AND COUNSELLING, SUBMITTED TO POSTGRADUATE SCHOOL IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DOCTOR OF PHILOSOPHY (Ph.D) DEGREE IN MEASUREMENT AND EVALUATION OF DELTA STATE UNIVERSITY, ABRAKA.

DEPARTMENT OF GUIDANCE AND COUNSELLING
DELTA STATE UNIVERSITY, ABRAKA

JUNE, 2016.

CERTIFICATION

We the undersigned, hereby certify that this research was carried out by Augustine UzochukwuObukohwoEkeke in the Department of Guidance and Counselling, Faculty of Education, Delta State University, Abraka.

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DEDICATION

This research is dedicated to my beloved wife and children; Lady Felicia Ekeke, Mr and MrsOchukoEkeke, Mr Reuben RukevweEkeke and Arch and MrsRukevweOniovukukor.

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ABSTRACT

The study investigated environmental factors as correlates of senior secondary school students' cognitive achievement in Biology in Delta and Edo States. The researcher raised seven research questions and seven null hypotheses to guide the study. The purpose of this study was to find out the relationship between environmental factors and senior secondary school students' cognitive achievement in Biology in Delta and Edo States. In the study, the researcher reviewed some related literature. The ex-post facto research design was used in the study. The population of this study was 251,770 students in SS1 and SS2 in Delta and Edo States. The researcher sampled 12 local government areas of the two states in 2010 and 2011. The multi-stage and stratified random sampling technique were used to draw a total of 4348 respondents for this study. The instrument for data collection in the study was Biology Promotion question papers for 2010 and 2011 for SS1 and SS2. The reliability of the instrument was established by the use of test- retest method. The reliability coefficient of 0.93 for SS1 and 0.75 for SS2 Biology Promotion Examination in Delta State for 2010 and reliability coefficient of 0.68 for SS1 and 0.80 for SS2 Biology promotion examination in Edo State for 2010.The reliability coefficient of 0.65 for SS1 and 0.79 for SS2 Biology promotion examination in Delta State for 2011 and the reliability coefficient of 0.69 for SS1 and 0.74 for SS2 Biology promotion examination in Edo state for 2011. The researcher visited the schools and obtained permission and administered the bio/data for the students. The researcher collected the results of students' promotion examination in Biology in 2010 and 2011 school academic records. The research questions were answered by correlation (coefficient of determination), while regression statistics was used to test the stated hypotheses at 0.05 level of significance. The findings provided that significant relationship existed between classroom adequacy and students' cognitive achievement in Biology in 2010 and 2011, there was significant relationship between parental support and students' cognitive achievement in Biology in 2010 and 2011, there was no significant relationship between laboratory adequacy and students' cognitive achievement in Biology in 2010, there was significant relationship between location of schools and students' cognitive achievement in Biology in 2010 and 2011, there was significant relationship between teacher's gender and students' cognitive achievement in Biology in 2010, there was significant relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 and 2011, there was significant relationship between classroom adequacy, parental support, laboratory adequacy, location of schools, teachers gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 and 2011, there was significant relationship between laboratory adequacy and students' cognitive achievement in Biology in 2011 while there was no significant relationship between teacher's gender and students' cognitive achievement in Biology in 2011 promotion examination.. Based on the findings, summary, conclusion and suggestions for further studies were made. It was

recommended that Biology teachers should always use their immediate environment to teach as it contains a lot of material resources for effective teaching of the concept in the subject.

CHAPTER ONE

INTRODUCTION

Background to the Study

Biology is a natural science subject consisting of contents from microscopic organisms to the biosphere in general, encompassing the earth's surface and all living things (Okwo&Tartiyus, 2004). Biology occupies a unique position in the school curriculum which is central to many science related courses such as Medicine, Pharmacy, Agriculture, Nursing, Biochemistry and so on. It is obvious that no student intending to study these disciplines can do without Biology. These facts, among others, have drawn attention of researchers and curriculum planners towards Biology as a subject in the school curriculum (Kareem, 2003). Inspite of the importance and popularity of Biology among Nigerian students, performance at senior secondary school level has been below average (Ahmed, 2008).

The desire to find out the causes of the poor performance in Biology has been the focus of researchers for some time now. It has been observed that poor performance in the science subjects is caused by the poor quality of science teachers, overcrowded classrooms and lack of suitable and adequate science equipment, among others (Kareem, 2003). In addition, the laboratories are ill-equipped when available and the Biology syllabus is over loaded (Ahmed, 2008). Despite Biology being considered the easiest and the most popular of the science subjects, students' cognitive achievement at secondary schools have generally remained poor, which poses a great challenge to all stakeholders in education, including teachers of Biology.

The poor academic achievement of students in science subjects especially Biology, has continued to be a major concern to all particularly those in the main stream of science education (Ariyo, 2006). This has also resulted into tension, depression and social maladjustment among some secondary school students who were not able to attain the desire grade required for promotion and admission into higher classes/institutions (Akinbade, 2005). Some of the factors that have been identified by previous researchers as causes of poor academic achievement of students in Biologyare: learners' non-challant attitude to school work (Ariyo, 2006), lack of understanding of basic scientific principles (Okebukola&Jegede, 1986),teachers qualification (Ibeagha-Jonathan, 1986) and school environment (Isugo-Abanihe&Labo-Popoola (2004).

Okebukola (1986) pointed attention to the quality of Biology teachers as the prime factor which attributed to the cause of students' inconsistent poor academic achievement in Biology Promotion Examinations. Oloyede (1992) seems to have proved the observation of Okebukola (1986) right by showing that a significant difference exists in the achievement of students taught by professionally trained and non-professionally trained teachers in the art of teaching Biology. Adepoju, (2002) reported that a significant relationship exists between teachers' variables such as gender, area of specialization, possession of academic qualification in education and the learning outcomes of secondary school students.

Studies have also shown that teachers' experience exert a great influence on the academic achievement of students. Ilugbusi, Falola and Daramola (2007) showed that teaching experience counts significantly in the determination of students' performance in examinations such as Promotion Examination, West Africa Senior School Certificate Examination (SSCE) and National Examination Council (NECO) Senior School Certificate Examination in Biology.

Literature has also indicated that teachers' attitude and students' attitude have exerted some influence on the academic achievement of students. For example Yara, (2009) reported that teacher's attitude towards science has strong relationship with students' science achievement as well as the students' attitude towards science. Also, Ogunwuyi, (2000) reported a significant relationship between teachers' attitude and students' achievement in Integrated Science. It appears students' academic achievement in science subjects at the senior secondary school level is becoming worse by the day. Educational institutions are usually located in a conducive environment that helps to promote teaching and learning. Biology being a core subject as recommended by the Federal Government of Nigeria (FGN) in the National Policy on Education (2009), both Arts and Science students offer Biology at Senior School Certificate Examination (SSCE) and Promotion Examination. This study therefore examined the environmental factors as correlates of senior secondary school students' cognitive achievement in Biology. Environmental factors are individuals or things that promote teaching and learning. Students' cognitive achievement in any subject is often related to environmental factors. Thus, the environmental factors affecting the achievement of students in Biology that need to be investigated include: classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids for Biology.

The classroom as a factor needs to be conducive for learning. The classroom should be spacious. The students are expected to be well seated. The classroom should be lighted and well ventilated. It should contain all the facilities for teaching and learning. Domike (2002) has observed classroom interaction pattern to be related to students' achievement. Okafor (1993) also found a significant relationship between classroom environment and students' achievement. It should be noted that a classroom that is not conducive may not promote students' achievement in Biology.

Parents constitute the environment of their children. Students learn better when they are encouraged by their parents. They give moral and financial support to their children by paying school fees and buying the required textbooks. Parentsprovide a suitable environment for students' achievement when they show concern to their children's learning and welfare. Parents' support in education therefore, was found to benefit their children due to physiological and psychological affinity (Tella&Tella, 2003). Thus, students may not achieve much when there is lack of parental support.

Students need laboratory for their practical work. Biology is one of the subjects that requires laboratory for practical work. A laboratory that is conducive and has all the facilities for learning will promote students' achievement in Biology. Students' achievement in Biology may be low if they are not exposed to laboratory environment. Adeyegbe (2005) Opined that laboratory adequacy is one of the factors that affects students' achievement.

The location of a school in rural or urban areas influences the achievement of students in Biology. It has been noted that the location of a school can influence a child's knowledge in science (Akpochafo, 2001 &Agboghoroma 2005). Senior Secondary Schools in Edo and Delta States are located in both rural and urban areas. It appears urban areasare given more attention than the rural areas as far as staffing and infrastructures are concerned. Adepoju (2001) has found that students in urban schools had a better achievement than their rural counter-parts.

The gender of teachers teaching Biology may be males or females. The students' interest or achievement is usually influenced by the gender of their teachers, which constitutes an environmental factor. For example, a male teacher teaching reproduction in Biology to female students may not arouse the same interest as a female teacher. Some students may see the teaching of reproduction to opposite sex as immoral while others may not. Be that as it may, it should be noted that gender of teachers as an environmental factor can affect the interest and

achievement of students in Biology. It has been found that students learn more when they are well taught and supervised by teachers (Cooper, 1998).

Teaching aids in the school environment arematerials that help to facilitate teaching and learning. It could be audio or visual as well as real or improvised. There are different types of teaching aids thata Biology teacher can use to promote teaching and learning. The teaching aids if properly used could enhance students' achievement in Biology. These teaching aids include microscopes, specimen of plants and animals, models, charts, computers, projectors, audio and video tapes amongst others. It has been pointed out that the use of teaching aids enhances teaching and learning of Biology (Umeoduagu, 2000).

The dependent variable of the study was Achievement while the independent variables were classroom adequacy, parental support, laboratory adequacy, location of school, teachers' gender and adequacy and utilization of teaching aids. The study therefore focused on the environmental factors as correlates of senior secondary school students' cognitive achievement in Biology in Delta and Edo States of Nigeria.

Statement of the Problem

The overall performance of students in Biology in Delta and Edo States has been poor. The low achievement of students' in Biology in Promotion and public external examinations (WAEC and NECO) has made educational researchers, parents and other stakeholders to be concerned about the cause of this poor performance. Biology is conceived by most students as the easiest science subject. However, the yearly percentage pass in Biology is very low compared with students' academic achievement in other subjects.

The role of teachers in students' academic achievement cannot be over emphasized. The progressive decline in secondary school students' academic performance in Biology has raised a lot of questions as regards Nigeria's educational system, of which the quality of teachers is a key factor.The absence of qualified Biology teachers can contribute significantly to the poor performance of students in Biology. It is an obvious and glaring fact that in most secondary schools in Nigeria, some teachers teaching this subject are not professionally qualified.

There has been incessant complaints and comments from stakeholders that the standard of education is falling due to poor performance of secondary school students' in both internal and external examinations like Promotion Examinations, WAEC and NECO. This has over the

years prompted many scholars to conduct several researches in an attempt to proffer solution to the problem but none has yielded the expected significant result.

InDelta and Edo States most of the senior secondary school students offer Biology as a core subject in their Senior School Certificate Examination (SSCE). It has been observed that many of the students fail Biology when the results are released by the Examining Bodies. Since the Senior School Certificate Examination (SSCE) is the final examination and Biology is a core subject, there is the need to prepare the students adequately by identifying those factors that are related to their achievement in Biology.

Under this premise, environmental factors may appear to be responsible. These factors include classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, and adequacy and utilization of teaching aids. These factors need to be investigated. Therefore, the problem of this study put in a question form is: what are the environmental factors that relate to senior secondary school students'cognitive achievement in Biology?

Research Questions

The following research questions guided the study:

(1) What is the extent of relationship between classroom adequacy and students' cognitive achievement in Biology in 2010 and 2011 academic sessions?

(2) What is the extent of relationship between parental support and students' cognitive achievement in Biology in 2010 and 2011 academic sessions?

(3) What is the extent of relationship between laboratory adequacy and students' cognitive achievement in Biology in 2010 and 2011 academic sessions?

(4) What is the extent of relationship between location of school and students' cognitive achievement in Biology in 2010 and 2011 academic sessions?

(5) What is the extent of relationship between teacher's gender and students'cognitive achievement in Biology in 2010 and 2011 academic sessions?

(6) What is the extent of relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 and 2011 academic sessions?

(7) What is the extent of relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of

teaching aids and students' cognitive achievement in Biology in 2010 and 2011 academic sessions?

Hypotheses

The following null hypotheses were stated:

1. There is no significant relationship between classroom adequacy and students' cognitive achievement in Biology in 2010 and 2011 academic sessions.
2. There is no significant relationship between parental support and students' cognitive achievement in Biology in 2010 and 2011 academic sessions.
3. There is no significant relationship between laboratory adequacy and students'cognitive achievement in Biology in 2010 and 2011 academic sessions.
4. There is no significant relationship between location of school and students' cognitive achievement in Biology in 2010 and 2011 academic sessions.
5. There is no significant relationship between teacher's gender and students' cognitive achievement in Biology in 2010 and 2011 academic sessions.
6. There is no significant relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 and 2011 academic sessions.
7. There is no significant relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 and 2011 academic sessions.

Purpose of the Study

The main purpose of the study was to find out the relationship between environmental factors and senior secondary school students' cognitive achievement in Biology in both Delta and Edo States. Specifically, the study seek to do the following:

i Determine the relationship between classroom adequacy and students' cognitive achievement in Biology.

ii Establish the relationship between parental support and students' cognitive achievement in Biology.

iii Describe the relationship between laboratory adequacy and students' cognitive achievement in Biology.

iv Predict the relationship between location of school and students' cognitive achievement in Biology.

v Determine the relationship between teacher's gender and students' cognitive achievement in Biology.

vi Examine the relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology.

vii. Determine the relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology.

Significance of the Study

The result of this study would be beneficial tostudents, teachers, parents, government and other stake-holders in education. The results of the study would enable all stakeholders to be aware of the environmental factors affecting the students' cognitive achievement in Biology and would therefore help to guide and counsel both teachers and students in the teaching/learning process in order to improve the performance of students in both internal and external examinations.

Teachers would be able to access and take maximum advantage of their immediate environment to improve on their teaching and also get to know the progress being made by their students. Parents wouldbe able to knowthat the achievement of their children is influenced by their immediate environment. Thus, the result of the study would equally help parents to be more involved in the education of their children by providing them with the necessary financial and moral support.

The result of study wouldprovide information to government about the environmental factors affecting the achievement of students in Biology. The environmental factors focused in the study include: classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender and adequacy and utilization of teaching aids. These factors wouldguide government in improving the facilities in schools to increase the achievement of students in both internal and external examinations in Biology.

Limitation of the Study

The generalizations made with respect to this study are the following limitation:

The study is restricted to only SS1 and SS2 students in Delta and Edo states in 2009/2010 and 2010/2011 academic sessions. Since different students were used for the study, it could be assumed that they might not have been of equal attributes in terms of cognitive ability. Many classroom environmental factors contribute to student achievement in Biology, the inclusion of few variables in this study may have affected the findings of this study.

Scope and Delimitation of the Study

The study focused on the relationship between environmental factors and senior secondary school students' cognitive achievement in Biology. The environmental factors which constituted the independent variables for the study are: classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender and adequacy and utilization of teaching aids. The dependent variable is student's cognitive achievement. The study was carried out in both Delta and Edo States.

Operational Definition of Terms

The following terms have been defined operationally as used in the study.

1. Environmental factors in the study refers to classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender and adequacy and utilization of teaching aids. These are factors in the environment that influenced the teaching and learning of Biology.
2. Cognitive achievement refers to the performance of students at Senior Secondary schoolPromotion Examination conducted by the Examinations and Standards Department of the Ministry of Education in Delta and Edo States in 2010 and 2011 academic sessions.
3. Students refer to SS1 & SS 2 students.
4. Parental supportrefers to different forms of parent participation in the education of the children which includes attending school functions,responding to school obligations,being involved in their children's school work, providing encouragement,

arranging for appropriate study time and space, modellingtheir study habit, monitoring homework, active tutoring of their children and provision of adequate necessary textbooks amongst others.

5. Parents used in this study include guardians, grand-parents, foster parents and anybody who takes care of the educational need of the students.

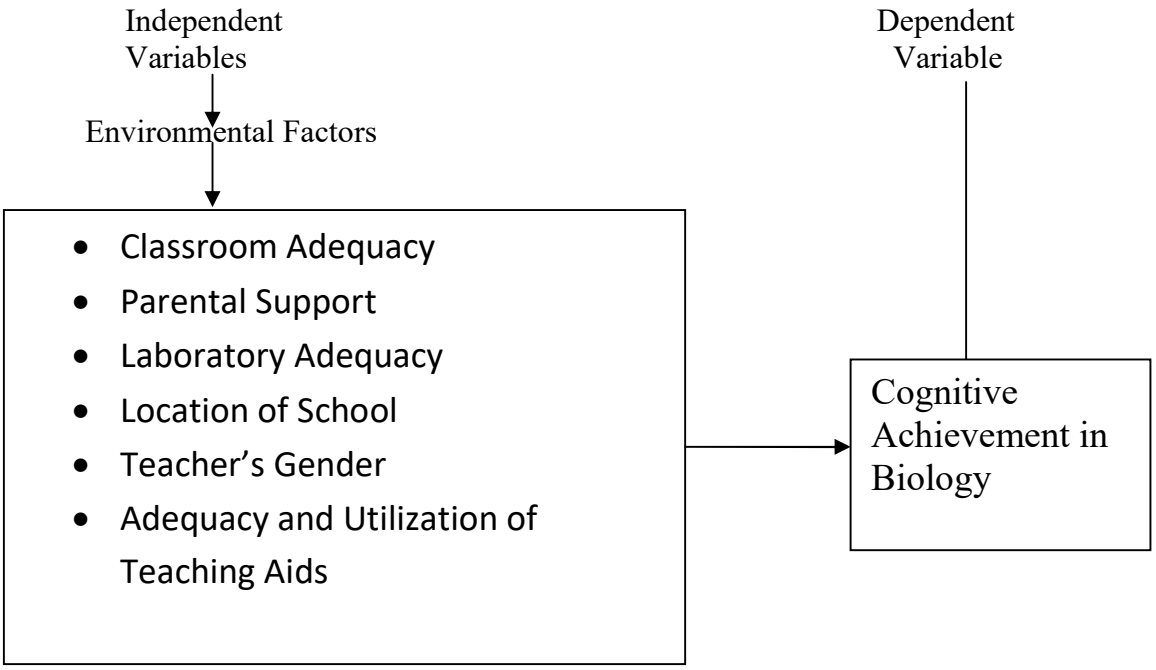
CHAPTER TWO

REVIEW OF RELATED LITERATURE

Theoretical and empirical findings related to the study were reviewed. The literature was reviewed under the following sub-headings:

1. Conceptual Model
2. Theoretical Framework.
3. Concept of Achievement
4. Students' Cognitive Achievement in Biology in Secondary Schools
5. Environmental Factors as Related to Students' Cognitive Achievement in Biology.
6. Empirical Studies
7. Appraisal of Related Literature

Conceptual Model



Design by the Researcher Based on the Theory of Social Cognitive (1963) andGagne (1965)

The above diagram showed that the dependent variable of the study was Cognitive Achievement of students in Biology. The independent variables were the environmental factors. The study helped to find out how the environmental factors relate to students cognitive achievement in Biology. Therefore, theories that had to do with the characteristics of these entities as they affect learning were applied. The Social cognitive theory of learning and Gagne theory of learning were therefore applied, since the learning of any subject matter depended on the way it was presented to the learner by his or her teacher; the way the learners interacted with the learning experiences presented to them and the environment within which the learning took place. It was expected that these entities would be affected by variables that had to do with them such as laboratory adequacy, school location, teacher'sgender and background knowledge in Biology and amongst others. The sociallearning theory (1963) andGagne (1965) therefore, provided the theoretical basis used for the study.

In 1963, Bandura and Walters broadened the social learning theory with the principles of observational learning and vicarious reinforcement. The social learning theory deals with cognitive, emotional aspect and aspects of behaviormeant to understand thebehavioral changes. The social cognitive learning theory explained how people acquired and maintained certain behavioral patterns in an environment. It also provided a frame-work fordesigning, implementing and evaluating programs. Environment refers to the factors that can affect a person's behavior. These are social and physical environments. Social environment include family members,schoolmates, friends, teachers and colleagues.Physical environment is the size of a classroom,the school laboratory,learningmaterial resources, teaching aids and so on. Environment and situation provide the framework for understanding behaviour. The situation refers to the cognitive or mental representation of environment that may affect a person's behaviouralperception of place,time,physical features and activity (Glanz,Rimer&lewis,2002).The environment provides models for behavior. Observational learning occur when a person watches the actions of another person and the reinforcement that the person receives.

Gagne's theory of instruction is commonly broken into three areas; the taxonomy of learning outcomes, the condition of learning and the events of instruction. Gagne's taxonomy of learning outcomes is similar to Bloom's taxonomy of cognitive, affective and psychomotor outcomes. Both Bloom and Gagne believed that it was important to break-down human's

learned capabilities into categories or domains. Gagne's taxonomy consists of five categories of learning outcomes; verbal information, intellectual skills, cognitive strategies, attitudes and motor skills. Gagne, Briggs, and Wager (1992) explained that each of the categories leads to a different class of human performance.

Gagne's ideas of instruction are what he called "condition of learning". He broke them down into internal and external conditions. The internal conditionrefers to the previously learned capabilities. In other words, what the learner knows prior to the instruction. The external conditions deal with the stimuli (a purely behaviorist term) that are presented externally to the learner. For example, what instruction is provided to the learner?

Gagne's theory of instruction formed nine corresponding cognitive processesviz:

i. Gaining attention (reception)
ii. Informing learners of the objectives (expectancy);
iii. Stimulating recall of prior learning (retrieval);
iv. Presenting the stimulus (selective perception);
v. Providing learning guidance (semantic encoding);
vi. Eliciting performance (responding);
vii. Providing feedback (reinforcement);
viii. Assessing performance (retrieval);
ix. Enhancing retention and transfer (generalization).

These events provide the necessary conditions for learning and serve as the basis for designing instruction and selecting appropriate media. When followed, these events are intended to promote the transfer of knowledge or information from perception through the stages of memory. Gagne based his events of instruction on the cognitive information processing learning theory. The way Gagne's theory is put into practice is as follows: first of all, the teacher/instructor determines the objectives of the instruction. These objectives are then categorized into one of the five learning outcomesusing one of the standard verbs (State, differentiate, classify and so on) associated with the particular learning outcome. The teacher/instructor will now use the condition of learning for the particular learning outcome, to determine the condition necessary for learning. Finally, the events of instruction necessary to promote the internal process of learning are chosen and put into the lesson plan. The events then become the framework for the lesson plan or steps of instruction.

The implication of this is that teachers can encourage the students to meet their growth needs by enhancing the attractiveness of learning situation. When the environment where the child is learning (classroom, laboratory, location of school and so on) is made attractive, effective learningwill take place.

Thus, Gagne's theoretical formations are attempts by the teacher to identify aspects of learning and match them with the intellectual demands of each student. In other words, while development is subordinate to learning, Gagne's paradigm insists on identifying valid ordered sequences of instruction (pre – requisites) that can facilitate the learning of intellectual skills. Gagne's theory offers an opportunity for the Biology teacher to diagnose student's limitations and strengths more effectively, thus, permitting more adequate individualization and personalization of Biology instruction. Gagne's learning hierarchy also offers Biology teachers the opportunity of developing and conceptualizing agreed Biology goals and objectives in reality-oriented and learner-centered way. It is on this premise that Gagne anchored his belief that children learn in an ordered additive capability. That is, the simpler and more specific capabilities are learned before the next more complex and general capability. Gagne therefore considered previous experience to play a major role in determining students' cognitive achievement. It is within this framework that the study looked into the Environmental factors as correlates of senior secondary school students' cognitive achievement in Biology.

Concept of Achievement

Achievement is a fundamental aspect of everyday life, affecting people's work, interpersonal relationships, sense of being and leisure (Struthers, Menec, Schonwetter& Perry, 1996). Academic achievement of students especially at the secondary school level is not only a pointer to the effectiveness or otherwise of school but a major determinant of the future of youths in particular and the nation in general. The medium through which the attainment of individuals and the nation's educational goals can be achieved is learning. Learning outcomes have become a phenomenon of interest to all and this accounts for the reason why scholars have been working hard to unravel factors that militate against good academic performance(Aremu&Sokan, 2002).This phenomenon has been variedly referred to in literature as academic achievement, or scholastic functioning. Academic achievement of learners has attracted attention of scholars, parents, policy- makers and planners. Adeyemo (2001) opined that the major goal of school is to work towards attainment of academic excellence by students.

According to him, the school may have other peripheral objectives but emphasis is always placed on the achievement of sound scholarship. Besides, virtually everybody concerned with education placedpremium on academic achievement.Excellent academic achievement of children is often the expectation of parents (Osiki, 2001). At the onset of an activity, students differ in learning due to their prior experiences, personal qualities and social support. The latter includes the extent that parents and teachers encourage them to learn, their accessto resources necessary for learning and exposure to strategies that enhance skill acquisition and refinement. Therefore,parent's academic aspirations for their children influence their children's academic achievements both directly and indirectly (Bandura,Barbaranelli,Caparara, and Pastorelli, 2001).

Academic achievement of a student is always associated with many components of learning environment. According to Bosque and Dore (1998), learning and teaching environment ought to implement six functions: inform, communicate, collaborate, produce, scaffold and manage. They added that conceptually speaking, the learning environment refers to the whole range of components and activities within which learning happens. According to Sandberg (1998) learning environment refers to teacher's component role in providing something between loose guidance and direct instruction. It can be a human agent (present or distant), an intelligent agent or instructions in form of textbooks. This component provides information from the syllabus to the task level.

Student's motivation from learning is also generally regarded as one of the most critical determinants, which contribute to the success and quality of any learning outcome (Mitchell, 1992). Research shows that students' perceptions of academic competence decline as they advance in school (Eccles, Wigfield&Schiefele, 1998). Schunk and Pajares (2002) attributed this decline to various factors which include greater competition, less teacher attention to individual student's progress and stresses associated with school transition.

Another important determinant which should not be neglected is the family. Family is the primary social system for children from all cultures across the region. Rollins and Thomas (1979) found that high parental control were associated with high achievement. Cassidy and Lynn (1991) explored how family environment impacts motivation and achievement. This means that motivation served as a mediating variable between home background, personal characteristics and educational attainment. Higher-achieving students are likely to have positive feelings about their school experiences and attribute their success in high school to such things

as hard work, self-discipline, organization, ability, high motivation and avid reading (WAEC, 2005). Religiosity is also considered to be an aspect of the family environment that possibly influences academic achievement of students (Bahr, Hawks & Wang, 1993).

A study by Niebuhr (1995) examined relationships between several variables and students' academic achievement. His findings suggest that the elements of school climate and family environment have a strong direct effect on academic performance. Academic performance is typically assessed by the use of teacher ratings, tests, and exams (Howse, 1999). Students were usually more motivated by enthusiastic teachers who cared about students' learning.However, Niebuhr (1995) opined that there is no significant effect on the relationship of individual's motivation and its effect on academic achievement.

Study done by Hammer (2003) revealed that the home environment is as important as what goes on in the school. Important factors include parental supportto their children's education (moral and technical), checking of academic works, provision of relevant textbooks, how much and nature of TVprogrammes children are allowed to watch and how often students change schools. Achievement gap is not about what goes on once students get into the classroom, but about what happens to them before and after school. Parents and teachers have a crucial role to play to make sure that every child becomes a high achiever. Parental support has been identified as an important factor affecting student's achievement. Philips (1998) stated that parental education and social economic status have an impact on students' academic achievement. Students with parents who were college-educated tend to achieve at the highest levels. Income and family size were also stated to be modestly related to academic achievement of students (Ferguson, 1991).

Academic under-achievement in Biology is closely related tostudents emotional well-being and general psychological adjustment. Evidence shows that unhealthy emotions can undermine attention and memory. Depression leads to the biased recall of information (Forgas, 2001), while anxiety and worry decrease working memory capacity, making it particularly hard for students to perform complex cognitive tasks (Macleod &Donnellan ,1993) . Hostility makesit difficult for students to get along with teachers and fellow students (Heaven, 2001). In summary, evidence suggests that academic under-achievement is linked to emotional maladjustment.

Students' Cognitive Achievement in Biology in Secondary schools

The teaching of Biology as a subject in secondary schools is faced with many problems. The poor academic achievement of students in Biology as indicated in the report by WAEC, NECO and National Teachers Institute (NTI) as well as the result of State conducted PromotionExaminations havepersisted public outcry as regards to the falling standard of science education. This is mostly in the area of availability and adequacy of laboratory facilities and other teaching materials in their right proportion compared to the number of students studying science.

Biology is an important science subject that has to be given more priority. Biology enables one to understand himself and his immediate environment. Nevertheless, the knowledge acquired in Biology is applied in many fields such as Medicine, Biochemistry, Pharmacy, Microbiology, Agriculture, among others.

Students' cognitive achievement in Biology in Senior School Certificate Examination (SSCE) has been unsatisfactory over the years. Many scholars have advanced various reasons for this poor performance. Dinah (2013) concluded that, availability of text books, laboratory apparatus and other learning resources contribute significantly to the performance of students in Biology examination. He added that, students with positive attitude towards the subject, register better performance than those who had negative attitude. Those with positive attitude are motivated to work hard and this will reflect in the good marks scored in the examination. Suman, (2011) conducted a research on influence of parents' education and parental occupation on academic achievement of students. He concluded that education and occupation of parents, positively influence the academic achievement of their children. Femi (2012) concluded that educational qualification of parents and health status of students are significant factors that affect the academic performance of students. According to Akinsanya, Ajayi and Salomi (2014), parents' education has the highest significant influence on the academic achievement of students. This is because the children from educated families have a lot of opportunities to study hard due to their access to internet, newspaper, television and so on. They are also taught extra lessons at home while students raised from an illiterate family have limited access to such facilities.

It has been observed that the falling academic standard and the influencing factors include the economic status of the parents. A look at the present economic situation in the country reveals thatimpoverished parents send their children to do petty trading and house-hold

chores before going to school. It has been found that poverty of parents has elastic effects on their children's academic work as they lack enough resources and funds to sponsor their education and still provide good housing, food, medical care and social welfare services. However, Femi (2012) in his study stated that, socio-economic and education background of parents are not significant factors in students' academic performance. Also Osuafor (2013) in his research on influence of family background on academic achievement of secondary school Biology students, revealed that family structure, parents' occupation and educational level did not have significant influence on students' achievement in Biology.

Memon (2010) in his study, revealed that majority of students whose parents were well-educated performed better in matriculation examination as compared to those students whose parents were less educated or illiterate. Manalanga and Awelani (2014) concluded in their result, that the possible factors responsible for the poor performance of students in Biology include lack of financial support, lack of equipped libraries and laboratories. They continued that teachers should be encouraged to assess learners regularly on practical skills. Perhaps, more practical lessons should be availed and documented so that teachers could refer to them. They equally recommended regular inspection by authorities to ensure that actual order is adhered to (Wabuke, 2013).The problems of students' under achievement in Biology have been observed by many researchers and viewed in different angles due to its diversity. Cohen (1976) put it that "directly or indirectly classroom interactions are controlled by the teacher for it is he who promotes particular learning situation through his choice of objectives, organization of experience, selection of materials and methods in order to facilitate the students' academic performance. Owino, Ahmad &Yungungu (2014) attached the problems to inadequate supply of teaching and learning resource materials such as chemicals, charts, apparatus, models, local specimens, laboratories, textbooks, and libraries. They added that irregularities in the teaching of Biology such as administration of practicals, class discussions, teachers not allowing students to ask questions or giving prompt feedback on assignments or exams, making Biologyun-interesting and not conducting demonstrations during practicals are also responsible.

Environmental Factors as Related to Students' Cognitive Achievement in Biology

The Classroom Learning Environment:

Research in western countries has shifted attention away from school – level factors to learning environment of the classroom (Saburoh&Shyoichi, 1984). In fact, all factors that contribute to educational outcomes exist in one way or the other in classrooms that differ in terms of learning environments. They have unique effects on students learning independently at school and individual levels (Richard, 1994).

The classrooms' activities influence on students' achievement, is two or three times more than that at the school level. Classroom teaching is nearly a universal activity designed to help students to learn. It is the process that brings the curriculum into contact with students and through which educational goals are imparted on the students in order to achieve set educational goals. The quality of classroom teaching is therefore, a key to improving students' learning (Brown, McNamara, Olwen& Jones, 2003). However, a number of studies in classroom activities provide the critical link between students' achievement data and teacher's practices at classroom level.This link is unfortunately lacking in most natural education surveys (Smith, 1987).

Classrooms are the formal place which provides the opportunity of teacher–student interaction. The quality of teaching and learning environment in secondary schools is a continuing national concern. Learning is a lifelong complex activity which occurs in formal instructional setting and incidentally through experience (Driscoll, 2005). The environment is considered as the complex set of physical, geographical, biological, social, cultural and political conditions that surround individuals and determine their form and nature of survival. Classroom learning environment in secondary schools is an aggregate of all external conditions and factors influencing the life and nurturing of students (Barab& Duffy,2000;Fraser &Chionh, 2000). Studies revealed that there is a positive and significant relationship between classroom learning environment and students' cognitive and affective outcomes (Goh& Fraser,2000;Fraser & Chionh,2000;McRobbi,Roth &Lucus, 2000). Research studies have revealed thata school with fascinating classroom environment for learning and leisure, produces students with good academic achievement (Baek&Chio,2002). In many studies of association between classroom learning environment and students' achievement, classroom environment has been consistently identified as determinant of learning (Khine, 2000).

The classroom has long been recognized as critical milieu for students' educational achievement (Back & Choi, 2002). According to Wilson (1996), classroom learning environment refers to a place where students and teachers interact with each other and use a variety of tools and information resources in their pursuit for learning activities. The nature of the classroom environment and psycho – social interactions can determine how the students learn and achieve their goals(Mc Robbie, Roth &Lucus, 1997).

A lot of educators and researchers believe that classroom plays an important role in student's cognitive development. Research literature had revealed that students' perception about classroom environment had a consistent relationship between the nature of the classroom environment and students' achievement (Mc Robbie & Fraser, 1993). Further evidence from research studies showedthat students achieved better when they like the environment (Fraser & Fisher, 1983). Schools are under increasing pressure to provide an effective learning environment to maximize students' achievement.

The classroom assessment environment has been defined as the context created for learners by several aspects of teachers' use of formative and summative evaluations for their work.Assessment therefore, should as far as possible, be integrated into the normal teaching and learning programme. For instance, testing should be considered as an opportunity to learn (Anderson &Prophy, 1998).

In addition, teachers know how students are progressing and where they are having problems. They can use this information to make necessary instructional approaches of offering more opportunities for practice (Smith, 1987). Feedbacks are required because students need information about their accomplishments in order to grow and progress (Gerades, 1991). Feedbacks related to assessment outcomes help learners become aware of any gap that exists between their desired goal and their current knowledge, understanding, skills and guides them through actions necessary to achieve the set goal (Richard, 1994).

In Nigeria, the few interaction studies (Ajayelami, 1983; Akuezuilo, 1987; Domike, 2002; Emah, 1998; Iyewarum, 1983; Mani, 1986; Okafor, 1993; Okebukola, 1985; Okebukola and Ogunniyi, 1984; Ogunkola, 1999; Udeani, 1992) have indicated that some relationship exists between classroom interaction pattern and students' achievement. Okebukola (1986) reports that classroom participation had the greatest independent contribution (22%) to the variance in achievement score, while Udeani (1992) reports that classroom interaction

accounted for 74 and 71% of the variation in students' cognitive achievement and skill acquisition, respectively. Also,Okafor (1993) found a positive relationship between classroom interaction behaviour and students' level of achievement. However, these few studies on interaction patterns in Nigeria were mostly carried out in Biology classroom.

Nevertheless, there are different generic teaching skills in science subjects (Martin, 1963).Mc Donald's (1976) reported to the effect that patterns of effective and ineffective teaching performance differ by subjects which is suggestive of the fact that what obtains in Biology classroom may not be exactly so in Physics classroom. Again, academic achievement is likely to be dependent on the structure of the tasks required. The achievement of students in academic tasks which requires them to understand and reproduce information encountered during instruction (low academic tasks) is different from tasks that required them to apply the information and draw inferences (high academic tasks).

Parental Support and Cognitive Achievement in Biology

Parental support means different things to different people. A recent newsletter published by the Center for Comprehensive School Reform and Improvement (2006) explained that some people equate support to championing field trips or volunteering to serve in PTA committees while others define it as attending to the academic needs of their children or wards. No Child Left Behind (2001) described parental support as regular participation of parents in a two-way process, involving meaningful communication between students' academic learning and other school activities.Reenayand Vivian (2007) defined parental support as encompassing three areas: (a) direct contact with teachers, (b) parental actions at school, and (c) parental actions at home. In many schools, parents are engaged in the governance and planning processes in building students' achievement goals (Family Strengthening Policy Center, 2004). Nonetheless, parental involvement takes place when parents actively, resourcefully and responsibly contribute to promote and develop the well-being of their communities (Family Support America, 2001;Jesse,(2009). Research has shown that increase in parental support leads to an increase in students'academic achievement; better classroom behavior and conduct; greater self-esteem; increased motivation and attitude towards school; low rate of absenteeism and increased school satisfaction (Public School Review, 2003). Studies have also shown that children whose parents are involved in the education of their children show greater social and emotional development (Allen & Daly, 2002). In addition, parental support leads to greater self-

satisfaction; self-direction and control; social adjustment and competence; more supportive relationship; positive peer relationships; tolerance and less delinquent behaviors (Desforges&Abouchaar, (2003).

On parental support and academic achievement, studies have also shown that the two constructs seem to be positively related. Findings have demonstrated that parents' support in the education of the children have been found to be of benefit to parents, children and schools (Tella&Tella, 2003; Campbell, 1995; Rich, 1987). Rasinki& Fredrick, (1988) opined that parents play an invaluable role in laying the foundation for their children's learning.Zang&Carrasquillo (1995) similarly remarked that, when children are surrounded by caring, capable parents and are able to enjoy nurturing and moderate competitive kinship, a foundation for literacy is built with no difficulty. Cotton and Wikelund (2005) aptly capped it by asserting that the more intensively parents are involved in their children's learning; the more beneficial are the achievement effects. Thus, it is believed that when parents monitor homework, encourage participation in extra-curricular activities, are active in parents-teachers associations and help children develop plans for their future; children are more likely to respond and do well in school.Vamadevappa (2005) studied the impact of parental support on academic achievement among higher primary school students with the objective to find out the event of relationship between parental support and academic achievement by taking a sample of 200 students, studying in 7^{th} standard and found that there was a positive and significant difference in the achievement scores of boys and girls of high and low parental support.

Based on the results of sixty-six studies, Henderson &Berla (1994) were of the opinion that repeated evidence has confirmed that the most accurate predictor of student achievement is the extent to which the family support's child's education and not the family's level of income. As a matter of fact, McMillan (2000) noted that parental pressure has positive and significant effect on public school performance. This becomes particularly obvious when the exactness of the parental pressure is brought to bear on the children's academic performance.

Similarly, Schichedanz (1995) also reported that children of passive parents were found to perform poorly academically. Valez& Ryan (2005) reported that academic performance is related to having parents who enforce rules at home. The obviousness of the research findingsreported so far, is that family support improves children education by consistent, daily attendance (e.g. Cotton &Wikelund, 2001; Simon, 2000). In summary, research has shown that

parents do want to get along with their children's education, knowing fullywell that such support could promote better achievement.

However, parents need a better direction as to how they can effectively do this. According to a magazine report (2002), six types of program could be utilized by schools to build strong parental skills. These are: (a) Schools can assist families with parenting and child-rearing skills; (b) Schools can communicate with families about school programmes and students' progress and needs; (c) Schools can work to improve families as volunteers in school activities; (d) Schools can encourage families to be involved in learning activities at home; (e) Schools can include parents as participants in important schools decisions, and (f) Schools can communicate with agencies to provide resources and services for families, students and the community. The importance of these programmes further attest to the fact that student's academic performance is dependent upon the parent-school bond. Thus, the importance of parental support on academic performance of the children cannot be overemphasized. Adeyemo (2005) saw reason in this by stressing that there is need to foster home-school partnership.

The academic success is hinged on the children's innate abilities which reflects on the advantage of being in the socio-economic level of their parents (Machen, Wilson &Notar, (2005). Children who are economically advantaged receive enough stimulation at home thereby enhancing their academic achievement.

Parents' high aspirations do have additional benefit over and above the advantages children enjoy from being capable and receiving adequate stimulation and resources. One study found that higher level of parental aspiration lowered the likelihood of academic failure during primary school by 48% compared with equally poor but low aspiring parents (Machen, Wilson &Notar, 2005; Stelios, Georgion&Jourva, 2007; Zhao &Akiba, 2009).

Puph and De'Ah, (1989) identified five dimensions of parental support to include:

(i) **Non-Participation** –Parents are not actively involved in their children's learning. They may either be satisfied with what the school is offeringor are too busy at work with limited time for their children. Some of the parents are passive, simply because they lack confidence or may be unhappy with the form of partnership the school offers.

(ii) **Support** - This dimension of direct parental support occurs when parents are invited to attend events, e.g. parents/teachers' meeting thereby contributing to the development of school policies, or by providing money for learning resources.

(iii) **Participation** - Parents may wish to participate as helpers by providing assistance on outings, running a toy library, supporting children's learning in the setting and providing indirect support at home, that is, keeping informed about what happens to their children at school, monitoring their academic progress, reading to them and providing intellectually stimulating activities for them at home and within the community.

(iv) **Partnership -** This dimension of parental support is a wide scope which comes in form of partnership with practitioners. As a result of equal access to information and rewards, some parents may share in the diagnosis and assessment of their children, or involved in the selection of practitioners, or become practitioners if need be.

(v) **Control** – In this case, parents determine and implement decisions.Parents need to influence their children by increasing familiarity in Biology, taking interest in their school work, enrolling them in extra lessons, ensuring that home work is done, acquiring audio-visual and other electronic materials that can stimulate their interest in Biology based careers and encouraging the children to develop friendly attitude towards Biology. The effectiveness with which parents are able to motivate their children to learn science by way of enhancing their home and school learning environment is a function of their socio-economic status.

The fact that there is a positive relationship between parental influence, which is indices of socio-economic status of parents and the academic progress of their children, is established by Lee and Chroninger (1994) and Willms (1986). The negative attitude of Nigerian studentsis confirmed by poor performance in science subjects (Olatoye, 2004; Ogunniyi, 1996). Parents, irrespective of their economic status, are important stakeholders in the education sector and can actually challenge the incompetence of a science teacher as well as lack of commitment of national approach to science education reforms.

Parenting styles are related to the academic achievement of adolescents. Research indicates that authoritative parenting is most strongly associated with academic achievement, while permissive styles are not (Cohen & Rice, 1997). Infact authoritative aspects of parenting, facilitate academic performance (Steinbery, Elmen& Mounts, 1989). It was found that authoritative parenting was by far, the best predictor of school success among students. Moreover, parental encouragement and school involvement were greatest among authoritative parents. Lamborn and Colleagues (1991) found authoritative parenting to be associated with

emotional well-being and academic competence in youths, while Shucksmith&Colleagues (1995) also found positive attitudes to learning to be associated with authoritative parenting.

The Laboratory:

The laboratory has been described as a room or a building specially built for teaching by demonstration of theoretical phenomena into practical terms. With the laboratory experience, students will be able to translate what they have read in their textbooks into practical realities, thereby enhancing their understanding of the learnt concepts. Farombi (1998) opined that using laboratories in the teaching and learning of science and other science related subjects tend to make students understand and recall what they see more than what they hear. Laboratory is very important and essential in the teaching of Biology and success in thissubject is much dependent on the laboratory provision made for it. Lending credence to this statement, Ogunniyi (1982) said that there is a general consensus among science educators that laboratory occupies a central position in science instruction. It could be conceptualized as a place, where theoretical work is practicalized. Practicals in any learning experience involve students' activities such as observing, counting, measuring, experimenting, recording and carrying out fieldwork. These activities could not be easily carried out where the laboratory is not well equipped. Bajah (1980) found that the correlation between the laboratory adequacy and Biology and Chemistry achievement is significant. Ango and Silo (1986) asserted that laboratory work among others:

* stimulates learners' interest as they are made to personally engage in useful scientific activities and experimentation;
* affords the learner the basic skills and scientific method of solving problems; and
* promotes long term memory of the knowledge obtained.

When students are exposed to practicals or practical activities, they are stimulated to develop confidence and ability in problem solving (Onwu&Moneme, 1986; Raimi, 1998). Adequate laboratory helps to provide a forum wherein the learner is given the exercise to subject his beliefs, ideas, statement and theoretical proposition to tests. In the absence of adequate resources and equipment for practical activities, practicals can rarely be carried out by students at any level or frequency, in the learning of science in general and Biology in particular.

No matter how excellent and attractive a teaching-learning approach is, it only becomes relevant and important if practical activities are built into the daily teaching-learning experience

of students. To maintain and arouse the interest of students in this perspective, the teacher should be effectively involved in the process in order to transform knowledge and facts to the learner for better performance in any examination.

To what extent has laboratory been able to achieve these objectives? Odulaja and Ogunwemimo (1989) said that the teacher assumes a position of dispenser of knowledge with the laboratory serving the function of drill or verification. They further explained that at the other extreme, the teacher assumes the position of guide to learning while laboratory as the place where knowledge is discovered. However, there are growing evidences that teachers do not exhibit behaviors, which are complementary to achieving the stated objectives. These objectives include improving on:-

* Method of teaching practical work;
* Inadequacy or absence of well-equipped laboratories;
* High enrolment of students;
* Inadequacy of resources for teaching and learning practical work; and
* Quality and quantity of teachers.

In their opinions, Salisu and Ismila, (1999);Onosoga (1996) and Okegbile (1999) asserted that practical work has a basic important role in the teaching and learning of science. They further posited that practical activities have motivating and propelling effect on students thereby enhancing their understanding of science concepts and phenomena.

Nwachukwu (1984) discovered in her survey of resources for the teaching and learning of Biology in some new secondary schools in Lagos that there was a general inadequacy of resources. She also found among other things that:

* Out of 80% of the old schools that had laboratories, none had a well-equipped laboratory;
* About 40% of the schools had no laboratory at all, while the remaining 60% had rooms labeled laboratory without adequate apparatus. She concluded that teaching of Biology practical's would be difficult and that the students learning experience would be limited.

Gilbert (1994) and Hodson (1996) also lent credence to the significance of practical work in learning of science. In their submission, they identified six major significance of practical work in promoting effective learning of science thus:-

* Motivating students by stimulating their interest and enjoyment;

* Teaching laboratory skills;
* Assisting in concept acquisition and development;
* Developing and understanding of scientific inquiries and developing expertise in conducting inquires.
* Encouraging social skills development.
* Inculcating scientific attitudes.

Okoli (1995) reported that laboratories have become shelves of empty bottles of chemicalsand posited thatwith situation in most secondary schools, a shift in paradigm is urgently recommended. Adeyegbe (2005) listed laboratoryadequacy as one of the factors that affect the learning outcomes of students. In terms of academic achievement, Soyibo and Nyong (1984) showed that schools with well-equipped laboratories had better results in the certificate examinations than those that were ill-equipped. Corroborating this, Gana (1997) reiterated that students instructed entirely by the laboratory methods had higher attitudinal scores but lower achievement scores than students instructed entirely by the traditional lecture or textbook method.

Location of School:

The location of schools, whether urban or rural can influence a child's knowledge of the science subject as well as general knowledge and attitude (Ozurumba, 1982; Inomiesa, 1984; Teasdale, 1988; Adedayo, 1997 and Akpochafo, 2001). Studies carried out by Adedayo (1997) and Akpochafo (2001) showed that students from urban centers had higher scores on Raven Standard Progressive materials than rural students and that the environment influences a child's intellectual development in school. In another study, Abdullahi (1982) constructed a standard test for schools in urban and rural areas. He sampled 726 students from both rural and urban schools and concluded that students from urban schools performed better than students from rural schools. In a more specific approach, Adeyemi (1990) carried out an empirical study on the effect of school location on students' attitude to Biology. Although part of her findings seemed not to have supported urban over rural dominance in attitude formation, the post-test scores did favour the urban students in terms of attitudes towards Biology.

In another development,Agboghoroma (2005) in trying to ascertain the knowledge acquisition of urban and rural subjects in Integrated Science, used 360 JSS III students exposed to the guide-inquiry method as well as students not exposed to the guide-inquiry method and

with the use of covariance adjustment, found that there was a significant difference (improvement) in the knowledge acquisition of the exposed urban students.

Starts (1972) focused on the effectiveness of teaching methods in urban and rural areas in developing a better knowledge of science and measured students' knowledge before, during and after the use of the inquiry method to isolate the effect of methods on knowledge. The study was conducted with 173 ninth-grade Biology students for an eight-week period. Using covariance adjustment, he found that there was no significant difference in knowledge of Biology between high ability ninth-grade students exposed to the inquiry technique. Likewise, in an attempt to determine the effect of instructional strategies on Biology knowledge acquisition of Nigerian secondary school students in urban and rural areas, Ibegbulam (1980) found that there was no difference in knowledge between the two groups who took part in the study.While evaluating the Biology component of the Nigeria Secondary School Science project (NSSSP), Adeyemi (1990) compared the effect of instructional methods (activity-centred versus traditional mode) on cognitive achievement and attitude of students towards Biology. Part of her findings revealed that there was no significant difference in the attitude of the two group of students towards Biology.

The relationship between school location and students' academic achievement in science has been widely reported. Adepoju (2001) found that students in urban schools manifest more brilliant performance than their rural counter parts. Also Ogunleye (2002) and Warwick (1992) reported a significant difference in the achievement of students in urban and semi-urban areas. Mittal (2008) studied academic achievement of secondary school students in relation to their locality by taking a sample of 640 students of secondary schools and found that there was a significant difference in academic achievement of secondary school students of different localities. Academic achievement of urban locality was better than the academic achievement of rural locality of secondary school students.Urban locality students also had better teaching learning environment at school as well as at home than students of rural locality.

Learning Material Resources /Adequacy and Utilization of Teaching Aids in Biology.

School environment has been described as an organization where resources are produced, managed and organized in such a way that it enables the students to acquire desirable learning competencies. The process of managing and organizing resources is called resources utilization. The utilization of resources in teaching bring about fruitful learning since it

stimulates students' sense as well as motivates them. Denyer (1998), in his study on science games in national curriculum in the United Kingdom reported that games when used as a resource enables less able children to stay on task and remain motivated for longer period.

There are varieties of resources, which the science teacher can readily use to enrich learning. These resources are wind vane, rain gauge, meter rule, models, charts, preserved specimens of plants and animals, culturing equipment, herbarium, terrarium, vivarium, microscope,among others (Olagunju, 2000). The resources should be provided in quality and quantity in Science,Technology and Mathematics (STM) for effective teaching-learning process (Umeoduagu, 2000). Nwoji,(1999), in an empirical study revealed that essential facilities such as radio, television, computers, chemicals, specimens, video tapes, stoves, burners, models and charts were not readily available in schools. This inadequacy of teaching material resources has been of serious concern to educators.

The decline in performance in Science, Technology and Mathematics (STM) may not be unconnected with poor learning environment created by this state of inadequate infrastructural facilities (Farombi, 1998). Oni (1995) also emphasized that the availability and adequacy of these facilities promote effective teaching and learning activities in schools while their inadequacy affect the academic performance negatively. Several efforts have been made by Science Teachers Association of Nigeria (STAN) to train secondary school teachers on improvisation techniques in various science subjects including Biology, hence there is need to evaluate how far teachers have been able to improvise instructional materials for effective teaching.

The enterprising teacher will develop many teaching aids from the local environment which will be more or less adapted to his particular teaching situation. Teaching aids must be considered in the light of their adaptability to local teaching needs, the learning needs of the students and the financial ability of the school system to provide these aids such as electricity, gas, suitable rooms and adequate fund for the operation of such equipment. Some "visual aids" like microscopes, stereopticons, opaque projectors, micro-projectors, stereoscopes, films, graphs, charts, and general equipment of the laboratory, are necessary in order to promote better learning situation and for better teaching (http:/WWW.jstor.org/pss/4436933).

Teaching aids help to stimulate the interest of the students, help the students form correct concepts, develop their powers of observation, extend their powers of vision, economize

their time and energy in learning, stimulate and cultivate the imagination and above all, develop an appreciation of the culture of the past by inculcating a different perspective of the things they observed through the scientific method.

Teaching aids can be listed as follows:
(a)Microprojectors,(b)Stereographs,(c)Stereoscopes,(d)Stereopticons,(e)Opaque projectors,(f) Fieldtrips ,(g)Models,(h) Biology clubs,(i) Projects,(j)Graphs,(k)Pictures,(l)Charts,(m)Lantern slides,(n)Bulletins,(o)Pamphlets,(p)Aquaria,(q)Terraria,(r)Museums,(s)Microscopes,(t)Microphotographs, (u)Motion-pie films,(v)Experiments,(w)Demonstrations,(x)Text books,(y)Class newsletters,(z)Library and so on.

Teachers should learn how to use their aids so as to benefit their students to the fullest. The teachers should therefore learn how to modify the equipment to meet their needs and those of the students they teach. (htt://www.jstor.org/pss/4436933).

Teacher's Gender

Gender is the division of people into two categories, "male" and "female". There had been divergent views and reports as to the comparative ability of males and females in human endeavors, especially in education. A survey conducted by Ogbonnaya and Okunamiri (2008) on teaching effectiveness of male and female teachers in Imo State Nigeria, revealed that female teachers are more effective than their male counterparts in the teaching of Biology and management of instructions while male teachers are better in school-community relationships. Fauth (1984) also noted that women have been found to be more concerned than men about the academic achievement of students and participate more in professional growth activities.

The literature on the relationship between teachers' gender and students' outcomes offers almost every possible conclusion. Thomas Dee (2006) investigated the effect of teachers' gender using National Education Longitudinal Survey (NELS) data on 8^{th} graders from the US and found that same-gender teachers had a positive effect, ie girls do better in schools when taught by women and boys do better when taught by men. Dee (2006) also observed that the effect of teacher's gender varies depending on the subject. For girls, the benefit of being assigned to a female teacher are premised on history. Okoro, Ekanen&Udo (2012), worked on the effect of teachers' gender on the academic performance of secondary school students in Uyo Metropolis, AkwaIbom State Nigeria and discovered that teacher-students interaction had an effect on students' academic performance, as girls performed better in Biology when they are

taught by female teachers while boys performed better in Mathematics when taught by male teachers.

On the other hand, Holmlund and Sund's (2005) results did not support the idea that sex of teachers had a positive causal impact on students' outcomes, measured in terms of course grades in secondary schools. In other words, they found no strong support for their initial hypothesis that teacher's sex improves students' outcomes. Krieg (2005) also found no evidence to support the hypothesis that the interaction of students and teachers' gender impacted upon test scores in Biology. However, the study on the production and utilization of material resources in Biology education in South West Nigeria Secondary Schools by Olagunju&Abiona (2008) revealed that male teachers' perception of utilization of instructional materials in teaching is higher than that of the female teachers. Khurshid and Zahur (2013), discovered that female teachers are more aware and utilize innovative teaching strategies than the male teachers in the teaching of Biology in secondary schools.

Empirical Studies

Most empirical studies showedthat students performed better in schools when parents are supportive (Fantuzzo, McWayne, Perry & Childs, 2004; Nyarko&Vorgelegt, 2007, Toper, Keane, Shelton & Calkins, 2010), but a few show that parental support may not always be associated significantly and positively with children educational performance (Izzo& Colleagues, 1999). In the Youth Save Ghana Experiment baseline data, most measure of parental supportis not associated statistically with high achievement in Mathematics and English. If this trendof non-significant relationship between parental support and educational performance changes after the YouthSave Intervention, we may learn new concept on the intervention of children's education.

Research findings have also shown that a continued effort of parental support throughout the child's education can improve academic achievement (Driessen, Smit&Sleegers, 2005; Fan, 2001; Hong & Ho, 2005). Oliver and Simpson (1988) opined that achievement and attitude do, however, go hand in hand and consequently positive behavior in the science (Biology) classroom is strongly related to achievement. Research in science education also suggests that gender may also influence attitudes towards the teaching-learning of science subject and consequently influence achievement. Several studies (Johnson, 1971; Simpson &Oliver, 1985) have proposed that more males than females have a positive attitude to science in general.

However, when the sub-disciplines of science are considered, females have a more positive attitude towards Biology.

Okoh (1995) reported that laboratories have become shelves of empty bottles of chemicals, while writing on the situation in the secondary schools today. Delivering a research entitled 'in search of indices for measuring the standard of education, a need for a shift in paradigm',Adeyegbe (2005) listed laboratory adequacy as one of the factors that affect the learning outcomes of students. In terms of academic achievement, Soyibo and Nyong (1984) have shown that schools with well-equipped laboratories have better results in the certificate examinations than those that are ill-equipped. Corroborating this, Gana (1997) reiterated that students instructed entirely by the laboratory method had higher attitudinal scores but lower achievement scores than students instructed entirely by the traditional lecture or textbook mode.

Adodoand Oyeniyi (2013) examined student variables and school facilities as correlates of secondary school students' academic performance in Biology in Ikere Local Government Area of Ekiti State, Nigeria. The study employed descriptive survey. The target population for the study was Biology students of senior secondary III (SS3) class in Ikere Local Government Area of Ekiti State. The sample for the study was four hundred and five (405) biology students (male & female) selected using stratified and simple random sampling techniques. Three hypotheses were raised to guide the study. The instruments used to elicit information was the questionnaire and Biology Achievement Test.

The data collected were analysed using pearson product moment correlation and multiple regression analysis at 0.05 level of significance. The results revealed that there was significant relationship between students' variables and their academic performance in Biology in secondary schools. But, there was no significant relationship between male and female students in their academic performance in Biology in secondary schools and it was also found that school facilities correlate with students academic performance in Biology in secondary schools. Based on the findings of the study, it was recommended that students of biology must cultivate right attitude towards the learning of biology and that government should provide school facilities irrespective of location.

Nsa (2014) undertook a study of Environmental variables and students academic performance in biology. The study was designed to assess the relationship between school environmental factors and students' academic performance in biology. The study adopted a

correlational survey design. A sample size of 300 students were randomly selected and used. To guide the study, two specific objectives and two null hypotheses were formulated and tested at 0.05 level of significance. Biology academic performance test (BAT) and biology practical checklist were developed and used to gather data for the study. The instruments were validated by three research experts and the reliability coefficient of 0.82 and 0.78 were obtained using pearson product moment correlation.

Data were analysed and null hypotheses test using PPMC and regression. The findings indicated that there was significant relationship between availability of laboratory facilities and students performance in biology. There was also significant relationship between availability of facilities and academic performance of students. It was recommended that secondary schools should create more conducive environments that facilitate students' acquisition and development of cognitive, psychology and affective skills in their academic endeavor.

Akinbobola (2015) carried out a study to examine science learning environment in Osun State of Nigeria. Stratified random sampling technique was used to select students from the eight (8) educational zone on Osun state. A total of 24 science teachers and 200 science students were used for the study. Ex-post facto design was adopted for the study. Science achievement test with reliability coefficient of 0.84 using Kuder Richardson 21 and science laboratory environment inventory with a reliability coefficient of 0.87 using cronbach alpha were the two instruments used for gathering data. Pearson product moment correlation, t-test and multiple regression were used to analyse the data.

The results showed that the science laboratory environment has significant relationship on students academic achievement in science. Also, there was a significant difference between students' preferred and actual laboratory environments in terms of cohesiveness, open-endedness, integration, rule clarity and material environments. The results also indicated that there was no significant difference in the way students and teachers perceived the same laboratory environment. It was recommended that students should be given the opportunity to work cooperatively, provided with frequent laboratory activities which are integrated with the regular science class sessions and be encouraged to be creative by allowing occasionally to pursue their own science interests and design their own experiments. Also standard laboratory spaces should be provided in schools with materials and equipment needed for the laboratory activities.

Ugwu (2011) investigated the relationship between gender and achievement of SS III students in Biology. Correlational research was used and stratified proportionate random sampling technique was employed. Four hundred and ninety-four (494) subject used for the study were randomly selected from 25 secondary schools across the six education zones of Enugu State. Intact classes were used. One intact was selected by simple balloting for schools that have more than one stream studying biology. Test of understanding of biology concepts (TOUBC) was the instrument in the study while the school certificate biology examination was the achievement test for the SSCE. Results showed from the simple correlation and regression analysis a weak negative relationship between gender and TOUBC. And no relationship between gender and SSCE results. Gender did not correlate significantly with students' achievement in SSCE. In conclusion, gender was significantly related to senior secondary school biology students' understanding of biology concepts but not a significant predictor of their attainment in SSCE.

Abaje and Awodun (2014) examined the impact of school location on academic achievement of science students in Senior Secondary School Certificate Examination. The purpose was to determine whether the geographical location has any impact on the achievement of the students in Biology, Chemistry and Physics. The targeted population for the study was senior secondary III students of public secondary schools in Ekiti West Local Government Area of Ekiti State, Nigeria. A total of two hundred and twenty (220) science students were randomly selected from six (6) public secondary schools selected for the study. Computerized result sheets sent to each school by WAEC were collected on the 2010-2013 May/June West African Senior Secondary School Certificate Examination (WASSSCE) from all the selected schools for the study.

The average of the scores of each candidate selected that formed the population of the study were computed in Biology, Chemistry and Physics, these serves as the achievements in science. Three null hypotheses were formulated and analysed using t-test and correlation statistical analysis at $p<0.05$ level of significant. The findings showed that there was no significant relationship in the achievement score of male and female students in the rural school areas and also there was no statistical significant difference in the achievement mean scores of male and female students in the rural school area. The findings further revealed that there was statistical significant difference in the achievement mean scores of students in rural and urban

school located areas. Based on the findings it was recommended that science educator and other stake holders should discourage gender stereotype in teaching and learning of science subjects irrespective of the geographical school location.

Abuh (2014) carried out a study on the psychosocial factors of classroom environment and cognitive styles as correlates of students' achievement in biology. The study was carried out as part of M.Ed thesis aimed at determining factors that influence achievement in biology. An ex-post facto research design was adopted for the study. A total of 150 SS2 biology students from 10 co-education schools in both private and public schools in Ankpa educational zone responded to the instruments used for the study. The instruments, biology classroom environment scale questionnaire (BCESQ) group embedded figure test (GEFT) and Cumulative Assessment Record Proforma (CARP) of SS2 biology students were standardized instrument adopted for use in the study. The instrument were face validated by five experts. The reliability coefficient of GEFT was found to be 0.97 using kuder Richardson (KR20). The BCESQ internal consistency was found to range from r= 0.455 to r= 0.726 because they are in cluster, while the reliability coefficient of the total instrument was found to be r= 0.600 using cronbach alpha reliability index. These instruments were used to collect relevant data from a sample of 150 SS2 students.

Hence, five research questions and three null hypotheses were formulated. Mean and deviation were used to answer research questions 1 and 3 and pearson's product moment correlation was used to answer research questions 2, 4 and 5. While linear regression analysis was employed to test the three null hypotheses. Psychosocial classroom environment factors and cognitive styles correlated positively with students achievement in senior secondary school biology. Also there was a significant difference in the student (s) achievement between perception of psychosocial classroom environment and their cognitive styles. Hence, students' perception of their biology classroom psychosocial environment and cognitive styles to some extent influenced their achievement in SS2 biology. Based on the findings, it was recommended that teacher should endeavor to create conducive and stimulating atmosphere for all the schools irrespective of the students' cognitive styles. Welfare of the teachers should be enhanced by way of better conditions of service as one of the many ways motivating them to perform in their classroom.

Gbore&Daramola (2013) investigated the relative contributions of selected teachers' variables and students' attitude towards academic achievement in biology among senior secondary school in Ondo State. It involved descriptive survey and ex-post facto research designs. A sample of 360 respondents were used which consists of 180 biology teachers and 180 senior secondary school three students were randomly selected from 36 senior secondary schools from the three senatorial district of Ondo State using stratified random sampling technique. Teachers Teaching Attitudinal Scale, Science Oriented Attitudinal Scale and an Inventory which requested for data from records on students' senior secondary school certificate examination grades in biology were used for data collection.

Data collected for the study were analysed using correlation matrix and multiple regression analysis. The results showed that significant relationships existed among the independent variables and student academic achievement in biology. Also 62.5% of the variance observed in students achievement in biology was explained by linear combination of the five predictor variables. Student attitude was the most potent contributor to the prediction. Teachers' workloads was the least contributor to the prediction. It was recommended that constant workshops and seminars should be made available by government for teachers to attend for the improvement of their teaching skills. Teachers and students were also charged to change their attitudes positively towards the teaching and learning of biology.

Adesoji&Olatunbosun (2008) examined students, teachers and school environment factors as determinants of achievement in senior secondary school biology in Oyo State. The study constructed and tested an eight variable model for providing a causal explanation of achievement of secondary school students in biology in terms of student variables attitude to learning biology, teachers attitude to biology teaching, attendance at biology workshop and school environment related variables-class size, laboratory adequacy and school location. The study used Maslow's motivational theory and Gagne's theoretical formula. The Gagne theoretical formulation was used to identify aspect of learning and to match these with the intellectual demand of the individual.

The study adopted an ex-post facto design. The sample was made up of 621 senior secondary III biology students and 27 senior secondary III biology teachers. Four sets of instruments were used, these were Biology Achievement Test (BAT), Teacher Attitude Towards Biology Teaching Scale (TATBTS) and Laboratory Attitude Inventory (LAI). Two

statistical procedures were employed to analysed the data. These were multiple regression and path analysis. The results revealed that 7.20% total effect on achievement in biology was accounted for by all the seven predictor variables- school location, laboratory adequacy, teachers attitude to biology teaching and teachers attendance at biology workshop had direct causal influence and also made significant contribution to the prediction of achievement in biology. Recommendation based on the significance of the variables were highlighted.

Appraisal of Reviewed Literature

Theoretical and empirical work of some authors and researchers on environmental factors that relates to senior secondary school students' cognitive achievement in Biology were reviewed. In essence, Biology as a subject is receiving a great deal of attention from educators and administrators. The world is simmering with Biological problems and concerns, ranging from the environment to an aging population. Therefore, Biology is important in the general education curriculum. We need, not only teachers and practitioners of science but a significant segment of society which can participate in matters of a biological nature as informed citizens, environmentalists, industrialists and administrators in many facets of our society.

The researcher's conceptual model, which was based on Social Cognitive theory (1963) and Gagne's theory (1965) identified some environmental factors that are related to students' cognitive achievement in Biology such as classroom adequacy, parental support,laboratory adequacy, location of school, teachers' gender and adequacy and utilization of teaching aids in Biology. No much studyknown to the researcher has been written on environmental factors particularly as related to students' cognitive achievement in Biology .This is the gap the studyhas covered.

CHAPTER THREE

RESEARCH METHOD AND PROCEDURES

This chapter focused on the method and procedures for the study. The following guidelines were considered:

(1) Design of the study
(2) Population of the study
(3) Sample and sampling techniques
(4) Instrument of the study
(5) Validity of the research instrument
(6) Reliability of the research instrument
(7) Method of data collection
(8) Data analysis

Design of the Study

The study employedex-post-facto design to determine the relationship between environmental factors and cognitiveachievement of students in Biology. These factors include classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender and adequacy and utilization of teaching aids. Each factor was correlated with cognitive students' achievement to find out the extent of relationship. Thedependentvariable was cognitive achievement and the independent variables were the environmental factors.

Population of the Study

The population of the study was made up of two hundred and fifty-one thousand, seven hundred and seventy (251,770) students in SS1 and SS2 who offered Biology in their Promotion Examinations in 2010 and 2011academic sessions in Delta and Edo States.In 2009/2010 academic session, SS1 students in Delta State were 32652 and SS2 students were 27601. In 2010/2011 academic session, SS1 students in Delta State were36487and SS2 students were 34249. In 2009/2010 academic session, SS1 students in Edo State were 34782 and SS2 students were 30533. In 2010/2011 academic session, SS1students in Edo State were 29593 andSS2 students' were25873. There are 43 Local Government Areas (L.G.As) in Delta and Edo States (25 in Delta and 18 in Edo). There are a total of 879 Senior Secondary Schools in both States. (See appendix A).

Sample and Sampling Techniques

The sample of this study comprised of 4348 students in SS1 and SS2 in Delta and Edo States. The multi-stage and stratified random sampling techniques were adopted to select the sample for the study. Three local Government Areas were selected from each State (according

to Senatorial Districts) for 2010 and 2011 respectively viz: Anoicha North, Burutu and Ughelli North for 2010 while Isoko South, Uvwie and Ndokwa West for2011 for Delta State.Similarly, Oredo, Owan East and Esan North-East for 2010 while Egor, Orhionmwon andAkoko- Edo for 2011 were used for Edo State.

In Delta State, SS1 and SS2 students in 2010 were 593 and 454 respectively while in 2011, SS1 and SS2 were 514 and 449respectively. Similarly, in Edo State, for 2010, SS1 and SS2 students were 759 and 610 respectively while in 2011, SS1 and SS2 students were 520 and 449 respectively.These represented 10% rule of thumb and 20% of sampled schools from the 12 Local Government Areas of the two Statesin 2009/2010 and 2010/2011 academic sessions. See appendix B.

Research Instrument

The data on students' cognitive achievement were collected fromBiology test items used for PromotionExamination in 2010 and 2011 academic sessions for SS1 and SS2 from Ministry of Education of Delta and Edo States respectively. These years were chosen because of the failure rate of students in Biology in both States. The instruments were made up of essay and objective test items. These determined the achievement of students in Biology.

Information about the environmental factors was obtained from school records throughBio/Data. The environmental factors of the classroom adequacy, parental support, laboratory adequacy, location of school, teachers' gender and adequacy and utilization of teaching aids constituted the variables that were scored 1 and 0. One (1) indicated when a student stated that an item was adequate while zero (0) indicated when a student stated that an item was inadequate.

Validity of the Instrument

The instrument used to determine students' cognitive achievement for 2010 and 2011 academic sessions were developed by Examinations and Standards Department in the Ministry of Basic and Secondary Education, Asaba, Delta State and Examinations and StandardsDepartment in the Ministry of Education, Benin City, Edo State. These were standardized achievement tests which had face and content validity. Though the Ministry did not provide the validity of the results, the tests were constructed using test blue-print. However, experts in Biology examined the questions and based on this, the judgment was made valid. The

researcher's Supervisors who are experts in Measurement and Evaluation also examined the test items.

Reliability of the Instrument

The bio/data for students was used to obtain information on two different occasions in order to ascertain the consistencywith regards to the reliability. The reliability of the instruments for 2010 and 2011 Biology promotion questions papers were not made available by Ministry of Basic and Secondary Education, Asaba, Delta State and Ministry of Education, Benin City, Edo State. Therefore, to determine how stable the instruments were over time, the researcher conducted test-retest reliability for 2010 and 2011 Promotion Examinations.

Thus, reliability coefficient of 0.93 for SS1 and 0.75 for SS2 Biology Promotion Examination in Delta State for 2010 and reliability coefficient of 0.68 for SS1 and 0.80 for SS2 BiologyPromotion Examination in Edo State for 2010 were obtained. Similarly, a reliability coefficient of 0.65 for SS1 and 0.79 for SS2 Biology Promotion Examination in Delta State for 2011 and the reliability coefficient of 0.69 for SS1 and 0.74 for SS2 Biology Promotion Examination in Edo State for 2011 were obtained. The two instruments were administered twicewithin an interval of two weeks to fifty students in Ondo and Ekiti States respectively for 2010 and 2011 to ensure stability over time using the test-retest method.

Method of Data Collection

The researcher visited the sampled schools in Delta and Edo States. Permission wasobtained from each school head before theBio/data wereadministered and collected from the SS1 and SS2 students. The aim was toobtain information on the environmental factors that can influence their cognitive achievement in Biology. Secondly,the results of students' Promotion Examination in Biology in 2010 and 2011 academic sessions were collected from the school academic records to determine the cognitive achievement of the SS1 and SS2students in Biology. While nominal values were assigned to gender and location. That is male = 1, female = 0, urban = 1 and rural = 0.

Method of Data Analysis

The data collected were analyzed using coefficient of determination and regression statistics to answer the research questions and test the stated hypotheses at 0.05 level of significance. The students' cognitive achievement scores in Biology Promotion Examination for

2010 and 2011 in the two States were converted to T-scores as a result of the population of the Biology students in SS1 and SS2. It was also converted based on classical test theory. The relationship between each factor and cognitiveachievement of students in Biology was determined and the amount of contribution of each factor to achievement was equally determined.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION

This chapter present the analysis of data collected for the study according to the specific research questions and hypotheses.

Research Question 1 (2010 academic session)

What is the extent of relationship between classroom adequacy and students'cognitive achievement in Biology in 2010 academic session?

Table 1: Correlation Analysis of Classroom Adequacy and Students' Cognitive Achievement in Biology in 2010 academic session.

Variable	N	r	r^2	r^2%	Decision
Classroom Adequacy	2416	0.054	0.003	0.3%	Positive relationship
Students' Cognitive Achievement					

Table 1, showed that r = 0.054 whichsignified the extent of relationship between classroom adequacy and students' cognitive achievement in Biology in 2010. This portrayed a low positive relationship between the two variables. Classroom adequacy, therefore contributed 0.3% of students' cognitive achievement in Biology.

Research Question 2

What is the extent of relationship between parental support and students' cognitive achievement in Biology in 2010 academic session?

Table 2: Correlation Analysis of Parental support and Students'Cognitive Achievement in Biology in 2010 academic session.

Variable	N	r	r^2	r^2%	Decision
Parental Support	2416	0.050	0.003	0.3%	Positive relationship
Students' Cognitive Achievement					

Table 2, showedthat r = 0.050 which signified the extent of relationship between parental support and students' cognitive achievement in Biology in 2010 academic session. The result revealed a low positive relationship as Parental support contributed 0.3% to students' cognitive achievement in Biology in 2010 academic session.

Research Question 3

What is the extent of relationship between laboratory adequacy and students' cognitive achievement in Biology in 2010 academic session?

Table 3: Correlation Analysis of laboratory adequacy and Students' Cognitive Achievement in Biology in 2010 academic session.

Variable	N	r	r^2	r^2%	Decision
Laboratory Adequacy	2416	0.032	0.001	0.1	Positive relationship
Students'Cognitive Achievement					

Table 3 showedthat r = 0.032 which signified the extent of relationship between laboratory adequacy and students' cognitive achievement in Biology in 2010 academic session. The result revealed a low positive relationshipas Laboratory adequacy contributed 0.1% to students' cognitive achievement in Biology.

Research Question 4

What is the extent of relationship between location of school and students' cognitive achievement in Biology in 2010 academic session?

Table 4: Correlation Analysis of Location of School and Students'Cognitive Achievement in Biology in 2010 academic session.

Variable	N	r	r^2	r^2%	Decision
Location of School	2416	0.069	0.005	0.5%	Positive relationship
Students' Cognitive Achievement					

Table 4, revealed that r = 0.069,which signified the extent of relationship between location of school and students' cognitive achievement in Biology in 2010 academic session. The coefficient of determination was 0.005 and the amount of contribution of school location tostudents' cognitive achievement is 0.5%. The result showed a low positive relationship between school location and students' cognitive achievement in Biology in 2010 academic session. The result indicated that location of school contributed to students' cognitive achievement in Biology.

Research Question 5

What is the extent of relationship between teacher's gender and students' cognitive achievement in Biology in 2010 academic session?

Table 5: Correlation Analysis of Teacher's Gender and Students' Cognitive Achievement in Biology in 2010 academic session.

	N	r	r^2	r^2%	Decision
Teachers' Gender	2416	0.098	0.010	1%	Positive relationship
Students' Cognitive Achievement					

Table 5, showed that r = 0.098 which signified the degree of relationship between teachers' gender and students' cognitive achievement in Biology in 2010 academic session. The coefficient of determination is 0.010 while the amount of contribution of teacher's gender to students' cognitive achievement is 1%. This result revealed a low positive relationship between teacher's gender and students' cognitiveachievement in Biology which implied that teacher's gender contributed to students' achievement in Biology in 2010 academic session.

Research Question 6

What is the extent of relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session?

Table 6: Correlation Analysis of Adequacy and Utilization of Teaching Aids and Students' Cognitive Achievement in Biology in 2010 academic session.

Variable	N	r	r^2	r^2%	Decision
Adequacy and Utilization of Teaching Aids Students'Cognitive Achievement	2416	0.025	0.001	0.1	Positive relationship

Table 6, indicated that r = 0.025 which was the extent of relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session. The coefficient of determination was 0.001 and the amount of contribution of adequacy and utilization of teaching aids to students' cognitive achievement in Biology was 0.1%. The result showed a low positive relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session. The result showed that adequacy and utilization of teaching aids contributed to students' cognitive achievement in Biology.

Research Question 7

What is the extent of relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session?

Table 7: Correlation Analysis of Classroom adequacy, Parental support, Laboratory adequacy, Location of school, teacher's gender, adequacy and utilization of Teaching Aids and Students' Cognitive Achievement in Biology in 2010 academic session.

Variable	N	r	r^2	r^2%	Decision
Classroom adequacy					
Parental support					Positive
Laboratory adequacy					
Location of school	2416	0.143	0.020	2%	Relationship
Teacher's gender					
Adequacy and utilization of teaching Aids					
Students' Cognitive Achievement					

Table 7 showed that r = 0.143 which was the extent of relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session. The coefficient of determination was 0.020 and the amount of contribution of classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids to students' cognitive achievement in Biology was 2%. This result revealed a positive relationship. The result indicated that classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids contributed to students' cognitive achievement in Biology in 2010 academic session.

Research Question 1 (2011 academic session)

What is the extent of relationship between classroom adequacy and students' cognitive achievement in Biology 2011 academic session?

Table 8: Correlation Analysis of Classroom adequacy and Students' Cognitive Achievement in Biology in 2011 academic session.

Variable	N	r	r^2	r^2%	Decision
Classroom adequacy	1932	0.076	0.006	0.6	Positive relationship
Students'Cognitive Achievement					

Table 8, showed that r = 0.076 which was the extent of relationship between classroom adequacy and students' cognitive achievement in Biology in 2011 academic session. The coefficient of determination was 0.006 and the amount of contribution of classroom adequacy to students' cognitive achievement in Biology was 0.6%. The result revealed a low positive relationship between classroom adequacy and students' cognitive achievement in Biology in 2011 academic session. The result indicated that classroom adequacy contributed to students' cognitive achievement in Biology.

Research Question 2 (2011 academic session)

What is the extent of relationship between parental support and students' cognitive achievement in Biology in 2011 academic session?

Table 9: Correlation Analysis of Parental Support and Students'Cognitive Achievement in Biology in 2011 academic session.

Variable	N	r	r^2	r^2%	Decision
Parental Support	1932	0.099	0.010	1	Positive relationship
Students'Cognitive Achievement					

Table 9, revealed that r = 0.099 which was the extent of relationship between parental support and students' cognitive achievement in Biology in 2011 academic session. The coefficient of determination was 0.010 and the amount of contribution of parental support to students' cognitive achievement in Biology was 1%. This showed a positive relationship between parental support and students' cognitive achievement in Biology in 2011 academic session.

Research Question 3 (2011 academic session)

What is the extent of relationship between laboratory adequacy and students' cognitive achievement in Biology in 2011 academic session?

Table 10: Correlation Analysis of Laboratory adequacy and Students' Cognitive Achievement in Biology in 2011 academic session.

Variable	N	R	r^2	r^2%	Decision
Laboratory adequacy	1932	0.045	0.002	0.2	Positive relationship
Students'Cognitive Achievement					

Table 10, showed that r = 0.045 which was the extent of relationship between laboratory adequacy and students' cognitive achievement in Biology in 2011 academic session. The coefficient of determination is 0.002 and the amount of contribution of laboratory adequacy to students'cognitive achievement in Biology was 0.2%. The result revealed a positive relationship between laboratory adequacy and students' cognitive achievement in Biology in 2011 academic session.

Research Question 4 (2011 academic session)

What is the extent of relationship between location of school and students' cognitive achievement in Biology in 2011 academic session?

Table 11: Correlation Analysis of Location of School and Students' Cognitive Achievement in Biology in 2011 academic session.

Variable	N	r	r^2	r^2%	Decision
Location of School					
	1932	0.062	0.004	0.4	Positive relationship
Students'Cognitive Achievement					

Table 11, showed that r = 0.062 which was the extent of relationship between location of school and students' cognitive achievement in Biology in 2011 academic session. The coefficient of determination was 0.004 and the amount of contribution of location of school to students' cognitive achievement in Biology was 0.4. This implied that location of school contributed to students' cognitive achievement in Biology in 2011 academic session.

Research Question 5

What is the extent of relationship between Teacher's Gender and students'cognitive achievement in Biology in 2011 academic session?

Table 12: Correlation Analysis of Teacher's Gender and Students' Cognitive Achievement in Biology in 2011 academic session.

Variable	N	r	r^2	r^2%	Decision
Teacher's Gender	1932	0.021	0.000	0	Positive relationship
Students'Cognitive Achievement					

Table 12, showed that r = 0.021 which was the extent of relationship between teacher's gender and students' cognitive achievement in Biology in 2011 academic session. The coefficient of determination was 0.000 and the amount of contribution of teacher's gender to students' cognitive achievement in Biology in 2011 was 0%. This showed a positive relationship between the two variables.

Research Question 6 (2011 academic session)

What is the extent of relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2011 academic session?

Table 13: Correlation Analysis of Adequacy and Utilization of Teaching Aids and Students' Cognitive Achievement in Biology in 2011 academic session.

Variable	N	r	r^2	r^2%	Decision
Adequacy and Utilization of Teaching Aids Students'Cognitive Achievement	1932	0.027	0.001	0.1	Positive relationship

Table 13 showed that r = 0.027 which was the extent of the relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2011 academic session. This revealed a low positive relationship between the variables. The coefficient of determination was 0.001 and the amount of contribution of adequacy and utilization of teaching aids to students' cognitive achievement was 0.1% in Biology in 2011 academic session.

Research Question 7

What is the extent of relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students'cognitive achievement in Biology in 2011 academic session?

Table 14; Correlation Analysis of Classroom Adequacy, Parental Support, Laboratory Adequacy, Location of School, Teacher's Gender, Adequacy and Utilization of Teaching Aids and Students' Cognitive Achievement in Biology in 2011 Academic Session.

Variable	N	r	r^2	r^2%	Decision
Classroom adequacy					
Parental support					Positive
Laboratory adequacy					
Location of school	1932	0.146	0.021	2.1%	Relationship
Teacher's gender					
Adequacy and utilization of teaching Aids					
Students' cognitive Achievement					

Table 14, indicated that r= 0.146 which was the extent of relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender and adequacy and utilization of teaching aids to students' cognitive achievement in Biology in 2011 academic session. The coefficient of determination was 0.021 and the amount of contribution of classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender and adequacy and utilization of teaching aids to students' cognitive achievement in Biology was 2.1%. This showed a positive relationship.

Hypothesis I (2010 academic session)

There is no significant relationship between classroom adequacy and students' cognitive achievement in Biology in 2010 academic session.

Table 15: Regression Analysis of Classroom Adequacy and Students' Cognitive Achievement in Biology in 2010 academic session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.054	0.003	0.002	10.62921

Anova

	Sum of Square	Df	Mean square	F	Sig
Regression	792.582	1	792.582	7.015	0.008
Residual	272733.993	2414	112.980		
Total	273526.555	2415			

Coefficient

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	28.955	0.766		37.795	0.000
Classroom adequacy	0.042	0.016	0.054	2.649	0.008

The result in table 15, revealed the regression output which showed a linear relationship between classroom adequacy and students' cognitive achievement in Biology in 2010 academic session. The computed F (1, 2414) = 7.015 $p<0.05$. Hence the null hypothesis was rejected. This implied that there was significant relationship between classroom adequacy and students' cognitive achievement in Biology in 2010 academic session. The R^2 adjusted value of 0.002 showed that 0.2% of variance in students' cognitive achievement in Biology was accounted for by classroom adequacy. The unstandardized regression coefficient (B) for predicting students'cognitive achievement from classroom adequacy was 0.042; the standardized coefficient (β) was 0.054. t = 2.649. Hence, classroom adequacy was significant at p-value of 0.05.

Hypothesis 2 (2010 academic session)

There is no significant relationship between parental support and students' cognitive achievement in Biology in 2010 academic session.

Table 16: Regression Analysis of Parental Support and Students' Cognitive Achievement in Biology in 2010 academic session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.054	0.003	0.002	10.62921

Anova

	Sum of Square	Df	Mean square	F	Sig
Regression	684.627	1	684.627	6.057	0.014
Residual	272841.928	2414	113.025		
Total	273526.555	2415			

Coefficient

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	33.797	1.196		28.254	0.000
Parental Support	-0.119	0.048	-0.050	-2.461	0.014

Table 16, indicated the regression output which showed a linear relationship between parental support and students' cognitive achievement in Biology. The computed $F(1, 2414 = 6.057$, $p<0.05$. Therefore, the null hypothesis was rejected. This implied that there was significant relationship between parental support and students' cognitive achievement in Biology in 2010 academic session.

The R^2 adjusted value of 0.002 showed that 0.2% of variance in students' cognitive achievement in Biology was accounted for by parental support. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from parental support was -0.119; the standardized coefficient (β) was -0.050, t = -2.461. Therefore, parental support was significant at p-value of 0.05.

Hypothesis 3 (2010 academic session)

There is no significant relationship between laboratory adequacy and students' cognitive achievement in Biology in 2010 academic session.

Table 17: Regression Analysis of Laboratory Adequacy and Students' Cognitive Achievement in Biology in 2010 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.032	0.001	0.001	10.63929

Anova

	Sum of Square	Df	Mean square	F	Sig
Regression	274.964	1	274.964	2.429	0.119
Residual	27325.591	2414	113.195		
Total	273526.555	2415			

Coefficient

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	29.533	0.904		32.661	0.000
Laboratory Adequacy	0.060	0.038	0.032	1.559	0.119

In table 17, the regression output showed a linear relationship between laboratory adequacy and students' cognitive achievement in Biology. The computed $F(1, 2414) = 2.429$, $p < 0.05$. Therefore, the null hypothesis was accepted. This revealed that there was no significant relationship between laboratory adequacy and students' cognitive achievement in Biology in 2010 academic session.

The R^2 adjusted value of 0.001 showed that 0.1% of variance in students' cognitive achievement in Biology was accounted for by laboratory adequacy. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from laboratory adequacy was 0.060; the standardized coefficient (β) was 0.032, $t = 1.559$. Therefore, laboratory adequacy was not significant at p-value of 0.05.

Hypothesis 4 (2010 academic session)

There is no significant relationship between location of school and students'cognitive achievement in Biology in 2010 academic session.

Table 18: Regression Analysis of location of School and Students' Cognitive Achievement in Biology in 2010 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.069	0.005	0.004	10.61906

Anova

	Sum of Square	Df	Mean square	F	Sig
Regression	1313.004	1	1313.004	11.644	0.001
Residual	272213.551	2414	112.765		
Total	273526.555	2415			

Coefficient

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	28.613	0.705		40.613	0.00
Location of School	1.481	0.434	0.069	3.412	0.001

Table 18, revealed the regression output that showed a linear relationship between location of schools and students'cognitive achievement in Biology. The computed F (1, 2414) = 11.644, P< 0.05. Therefore, the null hypothesis was rejected. Thisimplied that there was significant relationship between location of schools and students'cognitive achievement in Biology in 2010 academic session.

The R^2 adjusted value of 0.004 showed that 0.4% of variance in student's cognitive achievement in Biology was accounted for by location of schools. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from location of schools was 1.481; the standardized coefficient (β) was 0.069, t = 3.412. Therefore, location of schools was significant at P- value of 0.05.

Hypothesis 5

There is no significant relationship between teacher's gender and students' cognitive achievement in Biology in 2010 academic session.

Table 19: Regression Analysis of Teacher's Gender and Students'Cognitive Achievement in Biology in 2010 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.98	0.010	0.009	10.59291

Anova

	Sum of Square	Df	Mean square	F	Sig
Regression	2652.347	1	2652.347	23.637	0.000
Residual	270874.207	2414	112.210		
Total	273526.555	2415			

Coefficient

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	34.047	0.682		49.922	0.000
Teacher's Gender	-2.096	0.431	-0.098	-4.862	0.000

In table 19, the regression output revealed a linear relationship between teacher's gender and students'cognitive achievement in Biology. The computedF(1,2414) = 23.637, P < 0.05, hence, the null hypothesis was rejected. This showed that there was significant relationship between teacher's gender and students' cognitive achievement in Biology in 2010 academic session.

The R^2 adjusted value of 0.009 implied that 0.9% variance in students' cognitive achievement in Biology was accounted for by teacher's gender. The unstandardized regression coefficient (B) for predicting student's cognitive achievement from teacher's gender was -2.096; the standardized coefficient (β) was -0.098; t = -4.862. Therefore, teacher's gender was significant at p-value of 0.05.

Hypothesis 6 (2010 academic session)

There is no significant relationship betweenadequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session.

Table 20: Regression Analysis of Adequacy and Utilization of Teaching Aids and Students' cognitive Achievement in Biology in 2010 academic session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.025	0.601	0.000	10.64135

Anova

	Sum of Square	Df	Mean square	F	Sig
Regression	169.164	1	169.164	1.494	0.222
Residual	273357.391	2414	113.238		
Total	273526.555	2415			

Coefficient

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	29.007	1.565		18.534	0.000
Adequacy and utilization of Teaching Aids	0.123	0.101	0.025	1.222	0.222

The result in table 20, revealed the regression output which indicated a linear relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology. The computed F (1, 2414) = 1.494, P < 0.05. Therefore, the null hypothesis was accepted. This showed that there was no significant relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session.

The R^2 adjusted value of 0.000 showed that 0% of variance in students'cognitive achievement in Biology was accounted for by adequacy and utilizationof teaching aids. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from adequacy and utilization of teaching aids was 0.123; the standardized coefficient (β) was 0.025, t = 1.222. Therefore, adequacy and utilization of teaching aids was not significant at p-value of 0.05.

Hypothesis 7 (2010 academic session)

There is no significant relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session.

Table 21: Multiple regression analysis of classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in biology in 2010 academic session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.143	0.020	0.018	10.54602

Anova

	Sum of Square	Df	Mean square	F	Sig
Regression	5600.944	6	933.491	8.393	0.000
Residual	267925.611	2409	111.219		
Total	273526.555	2415			

Coefficients

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	28.784	2.543		11.318	0.000
Classroom adequacy	0.052	0.017	0.067	3.070	0.002
Parental support	-0.098	0.052	-0.041	-1.895	0.058
Laboratory adequacy	0.052	0.038	0.028	1.357	0.175
Location of school	1.561	0.463	0.073	3.374	0.001
Teacher's gender	-1.835	0.437	-0.086	-4.202	0.000
Adequacy and utilization of teaching aids	0.081	0.100	0.016	0.804	0.421

The result in table 21 indicated the multiple regression output which revealed a linear relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students'cognitiveachievement in Biology in 2010 academic session. The computed F (1, 2409) = 8.393, $p < 0.05$. Hence, the null hypothesis was rejected. This implied that there was significant relationship between classroom adequacy, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 academic session.

The R^2 adjusted value of 0.018 showed that 1.8% of the variance in students' cognitive achievement in Biology was accounted for by classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender and adequacy and utilization of teaching aids. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from classroom adequacy was 0.052, parental support = -0.098, laboratory adequacy= 0.052, location of school = 1.561, teacher's gender = -1.835 and adequacy and utilizationof teaching aids = 0.081, the standardized coefficient (β) for classroom adequacy was 0.067, t = 11.318; parental support = -0.041, t = 3.070; laboratory adequacy= 0.028, t = 1.357; location of school = 0.073, t = 3.374, teacher's gender = -0.086, t = -4.202, and adequacy and utilization of teaching aids = 0.016, t = 0.804. Hence, classroom adequacy, parental support, location of school and teacher's gender were significant while laboratory adequacy and adequacy and utilization of teaching aids were not significant.

Hypothesis 1 (2011 academic session)

There is no significant relationship between classroom adequacy and students' cognitive achievement in Biology in 2011 academic session.

Table 22: Regression Analysis of Classroom Adequacy and Students' Cognitive Achievement in Biology in 2011 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.076	0.006	0.005	8.99570

Anova

	Sum of Square	Df	Mean squares	F	Sig
Regression	910.121	1	910.121	11.247	0.001
Residual	156180.585	1930	80.923		
Total	157090.706	1931			

Coefficients

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	28.849	1.066		27.053	0.000
Classroom adequacy	0.086	0.026	0.076	3.354	0.001

In table 22, the regression output showed a linear relationship between classroom adequacy and students' cognitive achievement in Biology. The computed F (1, 1930) = 11.247, $p<0.05$. Therefore, the null hypothesis was rejected. This indicated that there was significant relationship between classroom adequacy and students' cognitive achievement in Biology in 2011 academic session.

The R^2 adjusted value of 0.05 revealed that 5% of variance in students' cognitive achievement in Biology was accounted for by classroom adequacy. The unstandardized regression coefficient (B) for predicting students'cognitive achievement from classroom adequacy was 0.086 while the standardized coefficient (β) was 0.076, t = 3.354. Therefore, classroom adequacy was significant at p –value of 0.05.

Hypothesis 2 (2011 academic session)

There is no significant relationship between parental support and students' cognitive achievement in Biology in 2011 academic session.

Table 23: Regression Analysis of Parental Support and Students' Cognitive Achievement in Biology in 2011 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.099	0.10	0.009	8.97776

Anova

	Sum of Square	Df	Mean squares	F	Sig
Regression	1532.264	1	1532.264	19.011	0.000
Residual	155558.442	1930	80.600		
Total	157090.706	1931			

Coefficients

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	24.412	1.834		13.309	0.000
Parental Support	0.197	0.045	0.099	4.360	0.00

Table 23, showed the regression output which revealed a linear relationship between parental support and students' cognitive achievement in Biology. The computed F (1, 1930) = 19.011, $p<0.05$. Therefore, the null hypothesis was rejected. This implied that there was significant relationship between parental support and students' cognitive achievement in Biology in 2011 academic session.

The R^2 adjusted value of 0.009 indicated that 0.9% of variance in students' cognitive achievement in Biology was accounted for by parental support. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from parental support was 0.197; the standardized coefficient (β) was 0.099, while t = 4.360. Therefore, parental support was significant at p-value of 0.05.

Hypothesis 3 (2011 academic session)

There is no significant relationship between laboratory adequacy and students' cognitive achievement in Biology in 2011 academic session.

Table 24: Analysis of laboratory Adequacy and Students Achievement in Biology in 2011 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.045	0.002	0.002	9.01273

Anova

	Sum of Square	Df	Mean squares	F	Sig
Regression	318.247	1	318.247	3.918	0.048
Residual	156772.459	1930	81.229		
Total	157090.706	1931			

Coefficient

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	36.642	2.174		16.858	0.000
Laboratory Adequacy	-0.137	0.069	-0.045	-1.979	0.048

The result in table 24 showed the regression output of a linear relationship between laboratory adequacy and students' cognitive achievement in Biology. The computed F (I, 1930) = 3.918, $p<0.05$. Therefore, the null hypothesis was rejected. This implied that there was significant relationship between laboratory adequacy and students' cognitive achievement in Biology in 2011 academic session.

The R^2 adjusted value of 0.002 revealed that 0.2% of variance in students' cognitive achievement in Biology was accounted for by laboratory adequacy. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from laboratory adequacy was -0.137, the standardized coefficient (β) was -0.045 while t = -1.979. Hence, laboratory adequacy was not significant at p – value of 0.05.

Hypothesis 4 (2011 academic session)

There is no significant relationship between location of school and students' cognitive achievement in Biology in 2011 academic session.

Table 25: Regression Analysis of Location of School and Students' Cognitive Achievement in Biology in 2011 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.062	0.004	0.003	9.00467

Anova

	Sum of Square	Df	Mean squares	F	Sig
Regression	598.557	1	598.557	7.382	0.007
Residual	156492.149	1930	81.084		
Total	157090.706	1931			

Coefficients

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	27.853	1.671		16.668	0.000
Location of school	0.107	0.039	0.062	2.717	0.007

The result in table 25 showed regression output of a linear relationship between location of schools and students' cognitive achievement in Biology. The computed F (1, 1930) = 7.382, $p < 0.05$. Hence, the null hypothesis was rejected. This indicated that there was significant relationship between location of school and students' cognitive achievement in Biology in 2011 academic session.

The R^2 adjusted value of 0.003 showed that 0.3% of variance in students' cognitive achievement in Biology was accounted for by location of schools. The unstandardized regression coefficient (B) was 0.107, the standardized coefficient (β) was 0.062, while t = 2.717. Therefore, location of schools was significant at p –value of 0.05.

Hypothesis 5 (2011 academic session)

There is no significant relationship between teacher's gender and students' cognitive achievement in Biology in 2011 academic session.

Table 26: Regression Analysis of Teacher's Gender and Students' Cognitive Achievement in Biology in 2011 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.021	0.000	0.000	9.01980

Anova

	Sum of Square	Df	Mean squares	F	Sig
Regression	72.234	1	72.234	0.888	0.346
Residual	157018.472	1930	81.357		
Total	157090.706	1931			

Coefficients

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	32.967	0.677		48.671	0.000
Teacher's Gender	-0.390	0.414	-0.021	-0.942	0.346

Table 26, indicated the regression output of linear relationship between teacher's gender and students' cognitive achievement in Biology. The computed F (1, 1930) = 0.888, $p<0.05$. Therefore, the null hypothesis was accepted. This implied that there was no relationship between teacher's gender and students' cognitive achievement in Biology in 2011 academic session.

The R^2 adjusted value of 0.000 showed that 0% variance in students' cognitive achievement in Biology was accounted for by teacher's gender. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from teacher's gender was -0.390; the standardized coefficient (β) was -0.021 while t = -0.942. Hence, teacher's gender was not significant at p –value of 0.05.

Hypothesis 6 (2011 academic session)

There is no significant relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2011 academic session.

Table 27: Regression Analysis of Adequacy and Utilization of Teaching Aids and Students' Cognitive Achievement in Biology in 2011 Academic Session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.027	0.001	0.000	9.01864

Anova

	Sum of Square	Df	Mean squares	F	Sig
Regression	112.359	1	112.359	1.381	0.240
Residual	156978.347	1930	81.336		
Total	157090.706	1931			

Coefficients

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	33.808	1.249		27061	0.000
Adequacy and Utilization of Teaching Aids	-0.045	0.039	-0.027	-1.175	0.240

Table 27 showed the regression output of a linear relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2011. The computed $F(1, 1930) = 1.381$, $p < 0.05$. Therefore, the null hypothesis was accepted. This indicated that there was no significant relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2011 academic session.

The R^2 adjusted value of 0.000 revealed that 0% of variance in students' cognitive achievement in Biology was accounted for by adequacy and utilization of teaching aids. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from adequacy and utilization of teaching aids was -0.045; the standardized coefficient (β) was -0.027 while t = -1.175. Hence, adequacy and utilization of teaching aids was not significant at p –value of 0.05.

Hypothesis 7 (2011 academic session)

There is no significant relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2011 academic session.

Table 28: Multiple Regression Analysis of classroom Adequacy, Parental Support, Laboratory Adequacy, Location of School, Teacher's Gender, Adequacy and Utilization ofTeaching Aids and Students'Cognitive Achievement in Biology in 2011 academic session.

Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimation
0.146	0.621	0.018	8.93684

Anova

	Sum of Square	Df	Mean squares	F	Sig
Regression	3346.364	6	557.727	6.983	0.00
Residual	153744.342	1925	79.867		
Total	157090.706	1931			

Coefficients

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	Sig
(Constant)	25.010	3.587		6.972	0.000
Classroom adequacy	0.066	0.027	0.059	2.421	0.016
Parental support	0.163	0.048	0.082	3.432	0.001
Laboratory adequacy	-0.145	0.069	-0.048	-2.113	0.035
Location of school	0.134	0.040	0.077	3.385	0.001
Teachers' gender	-0.773	0.429	-0.034	-1.805	0.071
Adequacy and utilization of teaching Aids	-0.058	0.040	-0.034	-1.450	0.147

Table 28 revealed a multiple regression output of a linear relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teachers' gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2011 academic session. The computed $F(6, 1925) = 6.983$, $p < 0.05$. Therefore, the null hypothesis was rejected. This indicated that there was significant relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teachers' gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2011 academic session.

The R^2 adjusted value of 0.018 showed that 1.8% of the variance in students' cognitive achievement in Biology was accounted for by classroom adequacy, parental support, laboratory adequacy, location of school, teachers' gender and adequacy and utilization of teaching aids and students' cognitive achievement in 2011. The unstandardized regression coefficient (B) for predicting students' cognitive achievement from classroom adequacy was 0.066, parental support = 0.163, laboratory adequacy = -0.145, location of school = 0.134, teachers' gender = -0.773, and adequacy and utilization of teaching aids = -0.058; the standardized coefficient (β) for classroom adequacy= 0.059, t = 2.421, parental support = 0.082, t – 3.432, laboratory adequacy = -0.048, t = -2.113, location of school = 0.077, t = 3.385 while t =-1.450. Therefore, classroom adequacy, parental support and location of school were significant while laboratory adequacy, teacher'sgender and adequacy and utilization of teaching aids were not significant.

Discussion of Results

Based on the outcome of the analyses presented above, the following deductions were made.

Classroom Adequacy and Students' Cognitive Achievement in Biology in 2010 and 2011 Promotion Examinations

The results in hypotheses 1 in 2010/2011 revealed that there was very low positive relationship between classroom adequacy and students' cognitive achievement in Biology in 2010 and 2011 academic sessions. Classroom teaching is nearly a universal activity designed to help students to learn. It is a process that brings the curriculum into contact with students in order to achieve set educational goals. These findings are in line with the studies of (Goh& Fraser, 2000; Fraser &Chioah, 2000; McRobbi, Roth &Lucus, 2000) who opined that there is a

positive and significant relationship between classroom learning environment and students' cognitive and affective outcome in Biology.

The finding is also in line with Okebukola (1986) who reported that classroom participation had the greatest independent contribution (22%) of the variance in achievement while Udeani (1992) equally reported that classroom interaction accounted for 74 and 71% of the variation skill acquisition.Okafor (1993) also found a positive relationship between classroom interaction and students level of achievement in Biology.

Parental Support and Students' Cognitive Achievement in Biology in 2010 and 2011 Promotion Examinations

The findings in hypotheses 2 in 2010/2011 indicated a low positive significant relationship between parental support and students' cognitive achievement in Biology in 2010 and 2011 academic sessions. The findings revealed that increase in parental supportmay be responsible forthe increase in students' cognitive achievement; better classroom behavior and conduct; increased motivation and attitude towards school. This finding is in line with the views of Vamadevappa (2005) who found that there was a positive and significant difference in the achievement scores of boys and girls of high and low parental support. Also McMillan (2000) noted that parental pressure has positive and significant effect on public school performance in Biology.

Laboratory adequacy and Students' Cognitive Achievement in Biology 2010 and 2011 Promotion Examinations

The findings in hypotheses 3 in 2010/2011indicated that there was low positive significant relationship between laboratory adequacy and students' cognitive achievement in Biology in 2010 and 2011 PromotionExaminations. The findings revealed that no matter how excellent and attractive a teaching-learning approach is, it only becomes relevant and important if practical activities are built into the daily teaching–learning experience of students. This findingis in line with that ofSoyibo&Nyong (1984) who opined that schools with well-equipped laboratories had better results in the certificate examinations than those that are ill-equipped. This finding is also in consonant with Bajah (1980) who found that the correlation between the laboratory adequacy and Biology achievement is significant.

Location of schools and Students' Cognitive Achievement in Biology in 2010 and 2011 Promotion Examinations.

The findings in hypotheses 4 in 2010/2011 showed that there was low positive relationship between location of schools and students' cognitive achievement in Biology in 2010 and 2011 Promotion Examinations. The findings supported the studies of Mittel (2008) who found that there were significant differences in academic achievement of secondary school students of different localities. He stated that secondary school students in urban locality had better teaching–learning environment at school, as well as at home, than students of rural locality, and so have better cognitive achievement in examinations. Also, Adepoju, (2001) found that students in urban schools manifest more brilliant performance than their rural counterparts in Biology.

Teachers' Gender and Students'Cognitive Achievement in Biology in 2010 and 2011 Promotion Examinations

The result of hypothesis 5 in 2010/2011 showed that there was significant relationship between teachers' gender and students' cognitive achievement in Biology in 2010. This finding supports the study of Sommer (1999) who found that the quality of teaching was a significant predictor of students' achievement even after controlling the effects of students' characteristics. However, in hypothesis 12, there was no significant relationship between teachers' gender and students' cognitive achievement in Biology in 2011. This finding supports the study of Smith (1987) who stated that teaching style exerted effect on students' cognitive achievement but independent of students' characteristics. The premise is that one teaching style fits a particular teacher-centered teaching style which may not work for a given number of diverse students' population. That is, problems occur when teaching style of male and female teachers conflict with that of students' learning styles, often resulting in limited learning or no learning on the part of the students.

Adequacy and Utilization of Teaching Aids and Students'Cognitive Achievement in Biology 2010 and 2011 Promotion Examinations

The findings in hypotheses 6 in 2010/2011indicated positive relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 and 2011 Promotion Examinations. The findings were in line with the studies of Akinyemi (1995) who revealed that the performance of Nigeria students in O/L Biology was generally

poor. He attributed this to many factors of which adequacy and utilization of teaching aids was considered as an important factor. In addition Jegede, OkotaandEniayelu (1992) reported that factors responsible for students' poor performance in Science Technology and Mathematics were inadequate number of learning facilities in schools,with regards to the consistent increase in the students' population.

The analysis of data presented in hypothesis 7 in 2010/2011 showed that there was a significant relationship among classroom adequacy, parental support, laboratory adequacy, location of school, teachers' gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology in 2010 and 2011 Promotion Examinations. The findings indicated that there was linear relationship among the variables. The result supported Umeoduagu (2000), Nwoji, (1999) who opined that essential facilities such as radio, television, computers, chemicals, specimens, video-tapes, stoves, burners, models and charts were inadequate if available in schools. This inadequacy of teaching materialshas been of serious concern to educators. Adepoju (2001), found that students in urban schools manifested more brilliant performance than their rural counterparts. Studies by (Goh& Fraser, 2000; Fraser &Chionh, 2000; McRobbi, Roth &Lucus, 2000) revealed that there is a positive and significant relationship between classroom learning environment and students' cognitive and affective outcomes. Also, McMillian (2000) noted that parental support has positive and significant effect on public school performance. This becomes particularly obvious when the exactness of the parental pressure is brought to bear on the children's academic performance. The study is also in line with Bajah (1980) who found that the correlation between laboratory adequacy and Biology achievement is significant.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary of Research

The study focused on environmental factors as correlates of senior secondary school students' cognitive achievement in Biology in Delta and Edo States. The study was aimed at establishing the environmental factors affecting senior secondary school students' cognitive achievement in Biology in 2010 and 2011 Promotion Examinations in Delta and Edo States. Seven research questions and seven hypotheses guided the study. To clarify the meaning of some words, operational definition of terms were given.

Variables such as classroom adequacy, parental support,laboratory adequacy, location of schools, teachers'gender and adequacy and utilization of teaching aids were reviewed. Also reviewed were concept of achievement and students' cognitive achievement in Biology in secondary schools.

Related literature on the conceptual framework for the study reflecting on the dependent variable (Cognitive Achievement) and independent variables (classroom adequacy, parental support, laboratory adequacy, location of schools, teachers' gender and adequacy and utilization of teaching aids were appraised.

The population of the study consisted of two hundred and fifty-one thousand, seven hundred and seventy (251, 770) students who offered Biology in their Promotion Examinations in SS1 and SS2 in Delta and Edo States in 2010 and 2011 academic sessions. A sample of four thousand, three hundred and forty eight (4348) students were drawn from the two States. The SS1 and SS2 Biology question papers for 2010 and 2011 Promotion Examinations were the instruments used for the study. The face and content validities of the instrument were established by the Examinations and Standards Department of the Ministry of Basic and Secondary Education, Asaba, Delta State and Examinations and Standards Department of the Ministry of Education, Benin City, Edo State. The reliability of the instrument was established using Pearson Product Moment Correlation statistics (Pearson r) for the eight set of scores produced from the responses from fifty students from Ondo and Ekiti States not included in the final sample (Test-Retest).

The data collected from the Bio-data proforma administered on the four thousand, three hundred and forty-eight (4348) students were analyzed using correlation, and regression techniques.

Findings

The following findings were made in the study:

1. There was a significant relationship between classroom adequacy and students' cognitive achievement in Biology Promotion Examination in 2010 and 2011 academic sessions.
2. There was a significant relationship between parental support and students' cognitive achievement in Biology Promotion Examination in 2010 and 2011 academic sessions.
3. There was no significant relationship between laboratory adequacy and students' cognitive achievement in Biology Promotion Examination in 2010 whereas there was a significant relationship in 2011 academic session.
4. There was a significant relationship between location of school and students' cognitive achievement in Biology Promotion Examination in 2010 and 2011 academic sessions.
5. There was a significant relationship between teachers' gender and students' cognitive achievement in Biology Promotion Examination in 2010 whereas there was no significant relationship in 2011 academic session.
6. There was no significant relationship between adequacy and utilization of teaching aids and students' cognitive achievement in Biology Promotion Examination in 2010 and 2011 academic sessions.
7. There was a significant relationship between classroom adequacy, parental support, laboratory adequacy, location of school, teacher's gender, adequacy and utilization of teaching aids and students' cognitive achievement in Biology Promotion Examination in 2010 and 2011 academic sessions.

Conclusion

Based on the findings of this study, the following conclusion was made:

Classroom adequacy, parental support, location of school and teachers' genderhadsignificant relationship with students' cognitive achievement in Biology Promotion Examination in 2010 academic session.Laboratory adequacy and adequacy and utilization of teaching aids had no significant relationship with students' cognitive

achievement in Biology Promotion Examination in 2010 whereas Classroom adequacy, parental support, laboratory adequacy, location of schools had significant relationship with students' cognitive achievement in Biology Promotion Examination in 2011 academic session. Teachers' gender and adequacy and utilization of teaching aids had no significant relationship with students' cognitive achievement in Biology Promotion Examination in 2011 academic session.

Recommendations

On the basis of the above findings, the following recommendations were made:

1. Biology teachers should always use their immediate environment to teach as it contains a lot of material resources useful for effective teaching of the concept ofBiology.
2. Government should make funds available to sponsor Biology teachers' to conferences, seminars and workshopson the production and utilization ofBiology materials as well as management.
3. There is need for parents, NGOs, Associations, Organizations, Philanthropists and so onto join hands with governments in procuring necessary Biology material resources as well as infrastructures for schools for effective teaching and learning.
4. Parents should be encouraged to buy recommended Biology text books for their wards to supplementteachers' notes.
5. Qualified Biology teachers should be employed to teach the subject in senior secondary schools coupled with thorough supervision on both teachers and students.
6. Biology teachers should make their lessons interesting and attractive for students to learn more effectively.

Contributions to Knowledge

This study has contributed to the existing stock of knowledge in the following ways:

i. The study has identified the environmental factors affecting students' cognitive achievement in Biology in Delta and Edo States.

ii. The study has provided general evidence that environmental factors such as classroom adequacy, parental support, laboratory adequacy, location of schools, teachers' gender and adequacy and utilization of teaching aids had influence on students' cognitive achievement in Biology in Delta and Edo States.

iii. The study has established that the maturation level of students influences students' cognitive achievement in Biology in Delta and Edo States.

iv. The study also established the need for parents to partner with Government and non-Governmental organization (NGO's) to enhance senior secondary school students cognitive achievement in Biology.

Implications of the Study to Measurement and Evaluation

The findings of this study point to the fact that:

Biology teachers should structure their classroom activities in such a way that students are allowed freedom to participate in Biology classes using a variety of activities, reinforcement and feedback. That is, it is important for teachers to work towards a teaching-learning process where responsibilities are shared with the students.

Parental supportto schools and students both morally and financially is very essential in theteaching and learning of Biology. This may involve contact with teachers; checking the attendance of children in school; monitoring of their children's activities in school and checking their periodical academic progress reports; provision of relevant textbooks and other essentials;as may be very helpful in attaining higher cognitive achievement in Biology.

Suggestions for Further Study

Environmental factors as correlates of senior secondary school students' cognitive achievement in Biology in Delta and Edo States of Nigeria have been investigated in this study. However, there is need for further studies in the following areas;

1. Parental support as a correlate of senior secondary school students' cognitive achievement in Biology in South-South Nigeria.
2. Laboratory adequacy and adequacy and utilization of teaching aids as correlate of senior secondary school students' cognitive achievement in Biology in South-West, Nigeria.
3. Teachers' gender, location of schools and classroom adequacy as correlates of senior secondary school students' cognitive achievement in Biology in South–Eastern Nigeria.

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Appendix A

Table 3.1: Population of SS1 and SS2 students in Delta and Edo States.

Number of schools/students in SS1 & SS2 in Delta State (2009/2010 Academic Session).

S/N	L.G.A	No. of schools	No. of students in SS1	No. of students in SSII	Total
1.	ANIOCHA NORTH	17	781	678	1459
2.	ANIOCHA SOUTH	17	11647	1255	2902
3.	BOMADI	8	392	369	761
4.	BURUTU	15	922	796	1718
5.	ETHIOPE EAST	24	1045	867	1912
6.	ETHIOPE WEST	12	756	597	1353
7.	IKA NORTH EAST	18	2060	1750	3810
8.	IKA SOUTH	17	2143	1318	3461
9.	ISOKO NORTH	18	1076	986	2062
10.	ISOKO SOUTH	18	1141	1020	2161
11.	NDOKWA EAST	16	588	503	1091
12.	NDOKWA WEST	21	1425	1214	2639
13.	OKPE	11	924	838	1762
14.	OSHIMILI NORTH	9	1270	1209	2479
15.	OSHIMILI SOUTH	8	2026	1838	3864
16.	PATANI	8	325	284	609
17.	SAPELE	16	1870	1651	3521
18.	UDU	8	1095	1041	2136

19.	UGHELLI NORTH	34	4231	3055	7286
20.	UGHELLI SOUTH	20	1308	1105	2413
21.	UKWUANI	12	864	789	1653
22.	UVWIE	11	1957	1872	3829
23.	WARRI NORTH	8	173	153	326
24.	WARRI SOUTH	12	2495	2284	4779
25.	WARRI SOUTH WESTS	4	138	129	267
	TOTAL	362	32652	27601	60553

Source: Ministry of Basic and Secondary Education, Asaba, Delta State

Number of schools/students in SS1 & SS2 in Delta State (2010/2011 Academic Session).

S/N	L.G.A	No. of schools	No. of students in SS1	No. of students in SSII	Total
1.	ANIOCHA NORTH	17	962	757	1719
2.	ANIOCHA SOUTH	17	1432	1403	2826
3.	BOMADI	8	390	372	762
4.	BURUTU	15	982	1127	2109
5.	ETHIOPE EAST	24	1397	1389	2786
6.	ETHIOPE WEST	12	1366	967	2333
7.	IKA NORTH EAST	18	2398	1851	4249
8.	IKA SOUTH	17	1721	1999	3720
9.	ISOKO NORTH	18	1088	1077	2165
10.	ISOKO SOUTH	18	1491	1313	2804
11.	NDOKWA EAST	16	756	646	1402

12.	NDOKWA WEST	21	1691	1313	3004
13.	OKPE	11	972	834	1806
14.	OSHIMILI NORTH	9	299	246	545
15.	OSHIMILI SOUTH	8	2211	2434	4645
16.	PATANI	8	367	366	733
17.	SAPELE	16	2404	2542	4946
18.	UDU	8	2144	1535	3679
19.	UGHELLI NORTH	34	4424	4068	8492
20.	UGHELLI SOUTH	20	1467	1397	2864
21.	UKWUANI	12	1060	1148	2208
22.	UVWIE	11	1957	1872	3829
23.	WARRI NORTH	8	173	193	366
24.	WARRI SOUTH	12	3203	3240	6443
25.	WARRI SOUTH WEST	4	141	160	301
	TOTAL	362	36487	34249	70736

Source: Ministry of Basic and Secondary Education, Asaba, Delta State

Number of schools/students in SS1 & SS2 in Edo State (2009/2010) Academic Session).

S/N	L.G.A	No. of schools	No. of students in SS1	No. of students in SSII	Total
1.	AKOKO-EO	20	1872	1776	3648
2.	EGOR	35	3496	3305	6801
3.	ESAN CENTRAL	19	810	722	1532
4.	ESAN NORTH EAST	30	2811	1980	4791
5.	ESAN SOUTH EAST	26	2564	2498	5062
6.	ESAN WEST	34	1267	1261	2528
7.	ETSAKO CENTRAL	16	647	569	1216
8.	ETSAKO EAST	17	869	792	1661
9.	ETSAKO WEST	25	119	1082	2201
10.	EGUEBEN	30	2113	2003	4116
11.	IKPOBA-OKHA	35	6547	5308	11855
12.	OREDO	37	3589	3006	6595
13.	ORHIONMWON	46	923	741	1664
14.	OVIA NORTH EAST	26	1166	755	1921
15.	OVIA SOUTH WEST	16	2238	2113	4351
16.	OWAN EAST	39	1186	1111	2297
17.	OWAN WEST	20	802	800	1602
18.	UHUNMWODE	46	763	711	1474
	TOTAL	517	34782	30533	65315

Source: Ministry of Education, Benin City, Edo State.

Number of schools/students in SS1 & SS2 in Edo State (2010/2011) Academic Session).

S/N	L.G.A	No. of schools	No. of students in SS1	No. of students in SSII	Total
1.	AKOKO-EDO	20	1916	1786	3702
2.	EGOR	35	2419	1969	4388
3.	ESAN CENTRAL	19	918	823	1741
4.	ESAN NORTH EAST	30	1198	1096	2294
5.	ESAN SOUTH EAST	26	2087	1897	3984
6.	ESAN WEST	34	1541	1302	2843
7.	ETSAKO CENTRAL	16	878	744	1622
8.	ETSAKO EAST	17	1013	989	2002
9.	ETSAKO WEST	25	882	659	1541
10.	EGUEBEN	30	2126	1981	4107
11.	IKPOBA-OKHA	35	3879	3245	7124
12.	OREDO	37	3305	2917	6222
13.	ORHIONMWON	46	855	731	1586
14.	OVIA NORTH EAST	26	1171	998	2169
15.	OVIA SOUTH WEST	16	2364	2021	4385
16.	OWAN EAST	39	1344	1183	2527
17.	OWAN WEST	20	948	836	1784
18.	UHUNMWODE	46	749	696	1445
	TOTAL	517	29593	25873	55466

Source: Ministry of Education, Benin City, Edo State

Appendix B

Table 3.2: Distribution of sampledLocalGovernment Areas, schools and students in SS1 and SS2 Biology Promotion Examinations in 2009/2010 and 2010/2011 Sessions in Delta and Edo States.

S/N	L.G.A	No. of Schools	No. of SS1 students	No. of SS2 students	20% of sampled schools	10% of sampled SS1 students	10% of sampled of SS2 students
1.	Aniocha North	17	781	678	3	78	68
2.	Burutu	15	922	796	3	92	80
3.	Ughelli North	34	4231	3055	7	423	306
4.	Oredo	37	3589	3006	7	359	301
5.	Owan East	39	1186	1111	8	119	111
6.	Esan North East	30	2811	1980	6	281	198
	Total for 2009/2010 session	172	13520	10626	34	1352	1064
7.	Isoko South	18	1491	1313	4	149	131
8.	Uvwie	11	1957	1872	2	196	187
9.	Ndokwa West	21	1691	1313	4	169	131
10.	Ego	35	2419	1969	7	242	197
11.	Orhionmuon	46	855	731	9	86	73
12.	Akoko-Edo	20	1916	1786	4	192	179
	Total for 2010/2011 session	151	10329	8984	30	1034	898
	Grand Total for 2009/2010 &2010/2011	323	23849	19610	64	2386	1962

Total of sampled of SS1 and SS2 students in the 12 Local Government Areas of the two States in 2009/2010 and 2010/2011 was 4348.

APPENDIX C

BIO DATA FOR STUDENTS

Dear Respondent,

The researcher needs information about the environmental factors affecting students' cognitive achievement in Biology. Please, be sincere in your response because all the information given will be kept confidential.

Ekeke, A.O.U.

Bio Data

Please, fill in the spaces provided and tick ( ) where appropriate on the data below:

1. State ……
2. Name of School:……
3. Classroom: Adequate ☐ Inadequate ☐
4. Parental Support: Good ☐ Poor ☐
5. Laboratory: Adequate ☐ Inadequate ☐
6. Location of School: Rural ☐ Urban ☐
7. Teacher's Gender: Male ☐ Female ☐
8. Teaching Aids:Adequate ☐ Inadequate ☐